

GE T2100 Treadmill

Service Manual

2021403-031

Revision A



GE Medical Systems
Information Technologies

gemedical.com

NOTE: The information in this manual only applies to the GE T2100 Treadmill. Due to continuing product innovation, specifications in this manual are subject to change without notice.

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1 Introduction

For your notes

Manual Information

Revision History

Each page of the document has the document part number and revision letter at the bottom of the page. The revision letter identifies the document's update level.

The revision history of this document is summarized in the table below.

Revision	Date	Comment
A	20 October 2005	Initial release of this manual.

Manual Purpose

This manual contains the instructions necessary to setup and service the equipment safely in accordance with its function and intended use. These instructions include but are not limited to:

- An explanation of functions and indicators
- The setup and checkout procedure
- Disassembly and assembly instructions for FRUs and accessories
- Troubleshooting guides
- Instructions for cleaning and preventative maintenance

Where necessary the manual identifies additional sources of relevant information and/or technical assistance.

Conventions

These are the conventions used in this manual.

Safety Messages

DANGER safety messages indicate an imminently hazardous situation which, if not avoided, **WILL** result in death or serious injury.

WARNING safety messages indicate a potentially hazardous situation which, if not avoided, **COULD** result in death or serious injury.

CAUTION safety messages indicate a potentially hazardous situation which, if not avoided may result in minor or moderate injury.

NOTE messages provide additional user information.

Definitions

- Items shown in **Bold** text are keys on the keyboard, text to be entered, or hardware items such as buttons or switches on the equipment.
- Items shown in *Italicized* text are software terms which identify menu items, buttons, or options in various windows.
- To perform an operation which appears with a plus (+) sign between the names of two keys, you press and hold the first key while pressing the second key once. This is called a keystroke combination. For example, “Press **Ctrl+Esc**” means to press and hold down the **Ctrl** key while pressing the **Esc** key.
- When instructions are given for typing a precise text string with one or more spaces, the point where the spacebar must be pressed is indicated as: <Space>. The purpose of the < > brackets is to ensure you press the spacebar when required.
- **Enter** means to press the “Enter” or “Return” key on the keyboard. Do not type “enter”.

Safety Information

Responsibility of the Manufacturer

GE Medical Systems *Information Technologies* is responsible for the effects of safety, reliability, and performance only if:

- Assembly operations, extensions, readjustments, modifications, or repairs are carried out by persons authorized by GE Medical Systems *Information Technologies*.
- The electrical installation of the relevant room complies with the requirements of the appropriate regulations.
- The equipment is used in accordance with the instructions for use.

General

This device is intended for use under the direct supervision of a licensed health care practitioner.

To ensure patient safety, use only parts and accessories manufactured or recommended by GE Medical Systems *Information Technologies*.

Contact GE Medical Systems *Information Technologies* for information before connecting any devices to this equipment that are not recommended in this manual.





Parts and accessories used must meet the requirements of the applicable IEC 601 series safety standards, and/or the system configuration must meet the requirements of the IEC 60601-1-1 medical electrical systems standard.




The use of ACCESSORY equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Consideration relating to the choice shall include:

- use of the accessory in the PATIENT VICINITY; and
- evidence that the safety certification of the ACCESSORY has been performed in accordance to the appropriate IEC 60601-1 and/or IEC 60601-1-1 harmonized national standard.

Equipment Symbols

The following symbols may appear on the equipment.

 001	<p>This symbol means that you must pay attention to the documents delivered with this equipment. It calls attention to the things to which you must pay special attention during operation and when the equipment is operated in conjunction with other equipment.</p>
 002	<p>In Europe, this symbol means dangerous or high voltage. In the United States, this symbol represents the caution notice below:</p> <p>CAUTION</p> <p>— To reduce the risk of electric shock, do NOT remove cover (or back). Refer servicing to qualified personnel.</p>
 003	<p>Type B equipment. Type B equipment is suitable for intentional external and internal application to the patient, excluding direct conductive connection to the patient's heart.</p>
 004	<p>Alternating current (AC)</p>

 <p>005</p>	<p>Equipotential (This is the ground lug.)</p>
 <p>006</p>	<p>Protective earth (ground)</p>
 <p>274A</p>	<p>This symbol indicates that the waste of electrical and electronic equipment must not be disposed as unsorted municipal waste and must be collected separately. Please contact an authorized representative of the manufacturer for information concerning the decommissioning of your equipment.</p>

Warnings and Dangers

WARNING

CONNECTION TO MAINS - This is class I equipment.

The mains plug must be connected to an appropriate power supply.

WARNING

DEFIBRILLATOR PRECAUTIONS — Do not come into contact with patients or unit during defibrillation. Otherwise, serious injury or death could result.

WARNING

EQUIPMENT MALFUNCTION — Replace only with the same type and rating of fuse.

WARNING

EXPLOSION HAZARD — Flammable anesthetic vapors or liquids can cause explosions.

Do NOT use in the presence of flammable anesthetic vapors or liquids.

WARNING

MOVING PARTS — To avoid injury to patient, wait until treadmill belt is moving before placing feet on belt.

WARNING

MOVING PARTS — To avoid injury to patient, keep hands, hair, jewelry and loose clothing away from moving parts.

WARNING

MOVING PARTS — To avoid injury to patient, operate the treadmill with 6 feet of clearance at the rear (end opposite the motor).

WARNING

SHOCK HAZARD — Improper use of this device presents a shock hazard. Strictly observe the following warnings. Failure to do so may endanger the lives of the patient, the user, and bystanders.

When disconnecting the device from the power line, remove the plug from the wall outlet first, before disconnecting the cable from the device. Otherwise there is a risk of coming in contact with line voltage by inadvertently introducing metal parts in the sockets of the power cord.

Devices may be connected to other devices or to parts of systems only after making certain that there is no danger to the patient, the operators, or the environment as a result. Standards IEC 60601-1-1/EN60601-1-1 must be complied with in all cases.

WARNING

SITE REQUIREMENTS — Do not route cables in a way that they may present a stumbling hazard.

Do not route cables underneath the equipment.

For safety reasons, all connectors for patient cables and leadwires are designed to prevent inadvertent disconnection, should someone pull on them.

For devices installed above the patient, adequate precautions must be taken to prevent them from dropping on the patient.

WARNING

TREADMILL CHANGES — Rapid changes in treadmill speed and/or grade during a stress test may result in injury.

DO NOT rapidly change treadmill speed and/or grade during a stress test.

Cautions

CAUTION

INJURY — Do not use the treadmill without proper footwear as injury to feet may result.

Always wear proper footwear when using the treadmill.

CAUTION

POWER REQUIREMENTS — Before connecting the device to the power line, check that the voltage and frequency ratings of the power line are the same as those indicated on the unit's label. If this is not the case, do not connect the system to the power line until you adjust the unit to match the power source.

This equipment is suitable for connection to public mains as defined in CISPR 11.

CAUTION

RESTRICTED SALE — U.S. federal law restricts this device to sale by or on the order of a physician.

CAUTION

SUPERVISED USE — This equipment is intended for use under the direct supervision of a licensed health care practitioner.

Make sure all users are under the direct supervision of a licensed health care practitioner.

Service Information

Service Requirements

Refer equipment servicing to GE Medical Systems *Information Technologies* authorized service personnel only. Any unauthorized attempt to repair equipment under warranty voids that warranty.

It is the user's responsibility to report the need for service to GE Medical Systems *Information Technologies* or to one of their authorized agents.

Failure on the part of the responsible individual, hospital, or institution using this equipment to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.

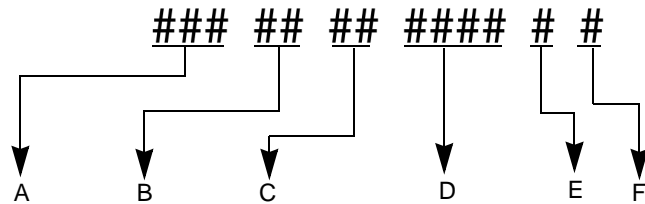
Regular maintenance, irrespective of usage, is essential to ensure that the GE T2100 Treadmill will always be functional when required

Equipment Identification

The Equipment Identification tag that contains the Product Code and Serial Number is located on the lip of the connection panel (on the back of the GE T2100 Treadmill).

Serial Number

Every GE Medical Systems *Information Technologies* device has a unique serial number for identification. An explanation of the Serial Number code is shown below.



- A Product Code (SBC = GE T 2100 Treadmill)
- B Year Manufactured (00-99)
 - 00 = 2000
 - 01 = 2001
 - 02 = 2002
 - (and so on)
- C Fiscal Week Manufactured
- D Production Sequence Number
- E Manufacturing Site
- F Miscellaneous Characteristic

2 Equipment Overview

For your notes

General Description

Standard features include the emergency stop (ESTOP) switch, a full handrail set, and a long, 60-inch walking surface. Designed for simplified serviceability, the GE T2100 Treadmill has fewer moving parts than other treadmills, built-in self-calibration, and easy-to-replace assemblies.

Intended Use

The GE T2100 Treadmill is intended for use with any one of the several GE Medical Systems *Information Technologies* exercise testing systems or the MTC-1 (manual treadmill controller) for administering a controlled exercise load during a diagnostic stress test.

Power Switch

When turning the GE T2100 Treadmill power switch off, there is a period of approximately 1 second when the remaining power cycles through the system. The GE T2100 Treadmill will not power up until all remaining power has cycled through the system. After turning the power off, wait approximately 1 second before turning the power back on.

Emergency Stop Switch (ESTOP)

The emergency stop switch (ESTOP) is intended for emergency situations where immediately stopping the GE T2100 Treadmill is required to deliver appropriate emergency care to the patient or health care provider, as implied by the American Heart Association “Guidelines for Clinical Exercise Testing Laboratories” (1995). It is not intended for routinely stopping the GE T2100 Treadmill.

NOTE

The ESTOP switch cable must be plugged into the GE T2100 Treadmill connection panel for the GE T2100 Treadmill to operate. If the ESTOP is not installed, the GE T2100 Treadmill will not operate.

Walking Belt

With the power switch in the OFF position (or with AC power disconnected), the GE T2100 Treadmill walking belt can revolve freely in either direction. With the power switch in the ON position but the GE T2100 Treadmill not running, the GE T2100 Treadmill walking belt is locked in both directions.

Press the emergency stop switch (ESTOP) and the GE T2100 Treadmill promptly stops but the walking belt can still revolve freely for 20 seconds (allowing for removal of foreign objects), after which the walking belt is locked in both directions.

After the ESTOP button is released, the walking belt enters an unlocked state for 20 seconds.

Drive Controller System

The 3 HP brushless DC motor is controlled by a separate control box, and connects directly to the front roller with a drive belt. A 15-pound flywheel, attached to the motor's drive shaft, keeps "footfall" variance to a minimum. An "adjustment plate" above the motor mounting bracket contains two vertical bolts for adjusting the drive belt tension.

The GE T2100 Treadmill can accommodate a weight capacity up to 450 lbs.

Elevation System

The elevation system uses a rack and pinion operation to raise and lower the GE T2100 Treadmill rather than jack screws and chains. The elevation motor attaches to a small gearbox that connects to the pinion shaft. The upper- and lower-limit switches are mounted on a fixed block in contact with a rack, making them easy to reach and adjust. Replacing the elevation motor only requires the removal of the three mounting bolts and detaching the motor from the pinion shaft coupling.

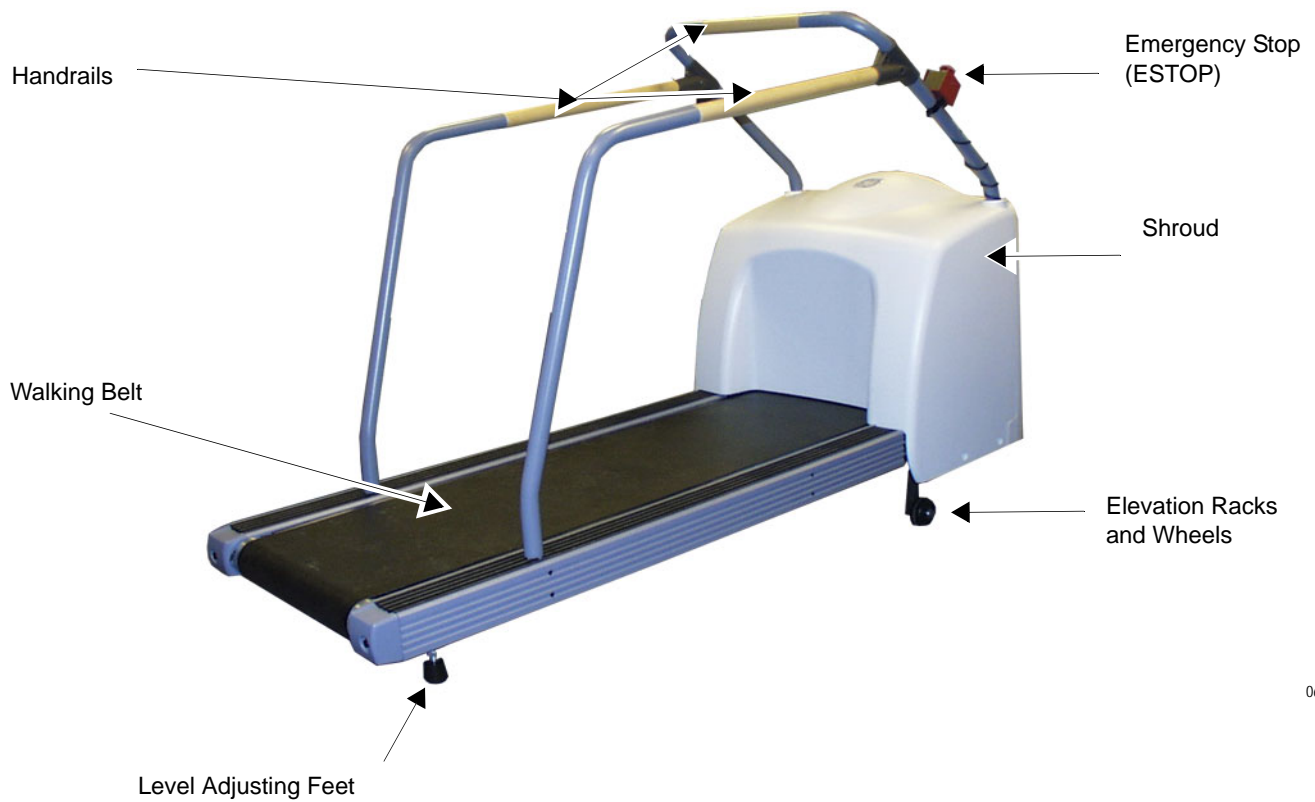
Bed Assembly

The one-piece bed assembly, with side rails and struts bolted together, enables quick belt and bed replacement for field service personnel.

Electronic Assembly

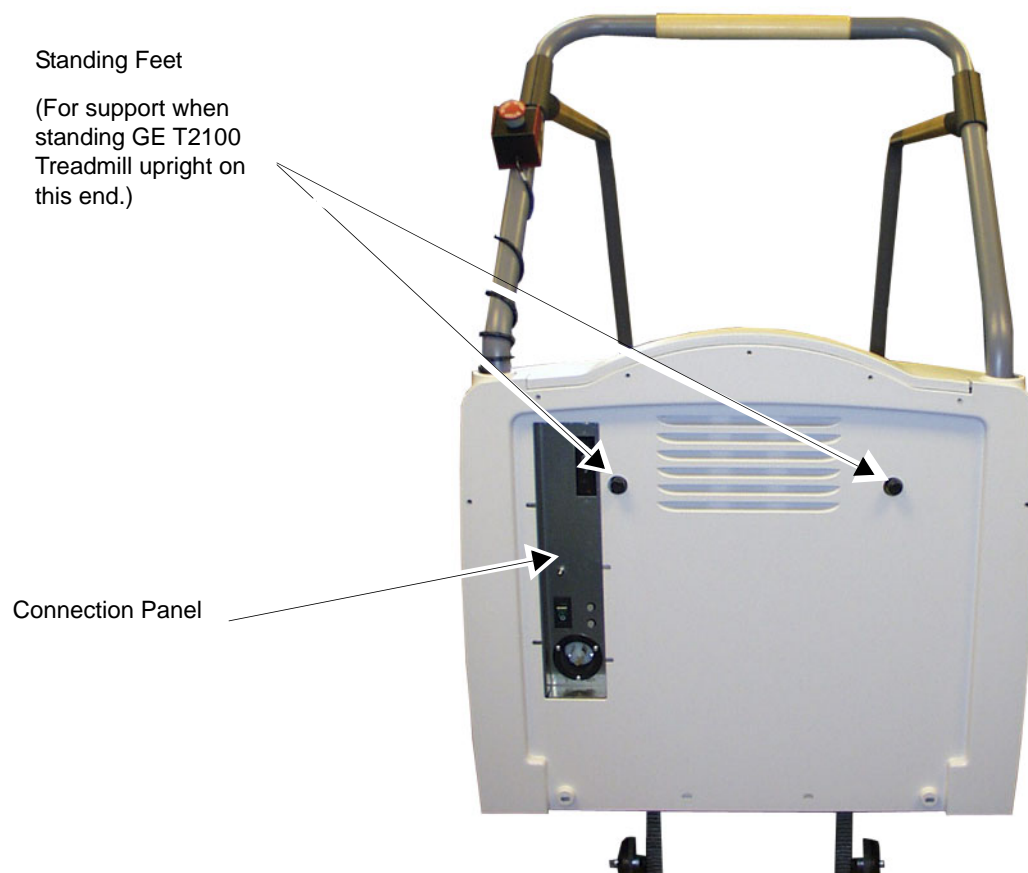
An isolated "electronics box" (e-box) contains the power supply PCB, control PCB, +24 V power supply, and an EMI Filter. The box is accessible with the shroud removed and contains parts that can be replaced in the field.

Side View



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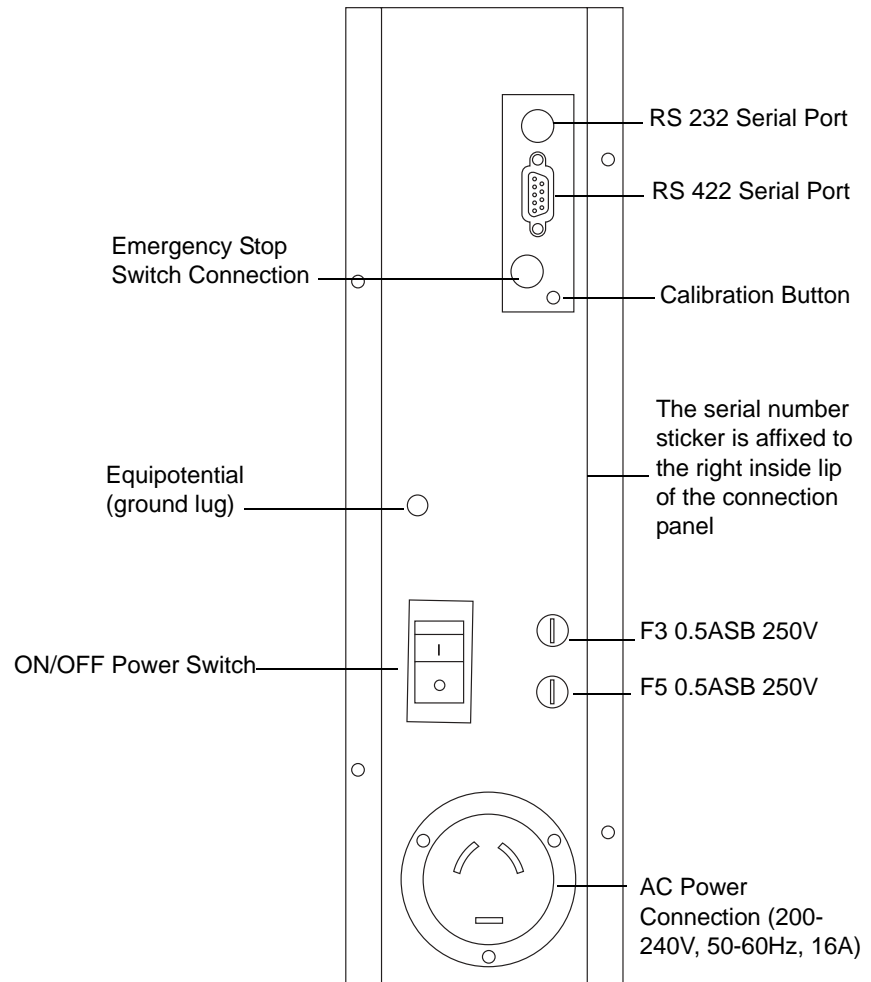
Rear View



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Connection Panel

The following illustration describes the connectors on the connection panel of the GE T2100 Treadmill, and identifies the general location of the serial number.



For your notes

3 Installation

For your notes

Tools Required

To install the GE T2100 Treadmill, you will need the following tools:

- Multi-meter
- Standard hand-tools
- T-bar allen wrench (included with GE T2100 Treadmill)
- Carpenter's level
- 15 mm (9/16") socket wrench

NOTE

See “**Required Tools and Supplies**” on page 7-3 for a complete list of tools required for maintenance of the GE T2100 Treadmill.

Safe Handling Guidelines

The GE T2100 Treadmill ships preset with an approximate 2% grade. This slight elevation provides for free wheel movement and prevents the shroud from scraping the floor.

If you are moving the GE T2100 Treadmill after it has been in operation, use the controlling equipment to set the grade to approximately 7%. Then remove power and disconnect all cables to the GE T2100 Treadmill before moving the unit.

NOTE

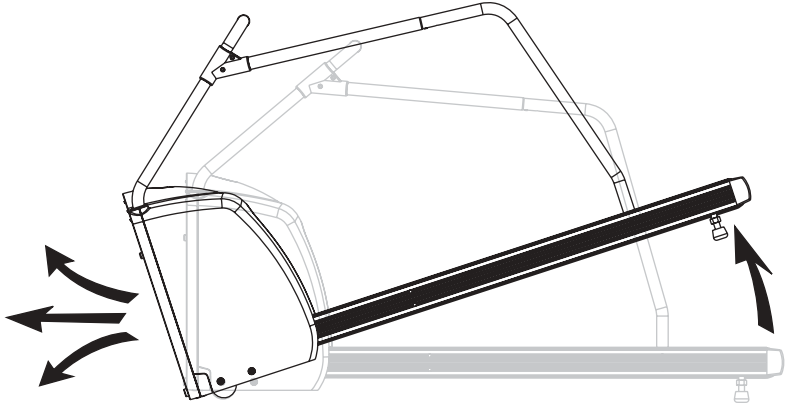
We recommend the GE T2100 Treadmill not be placed on carpet or carpet tile floors as a final location, as continual movement of the wheels may eventually damage the carpet and possibly the GE T2100 Treadmill.

WARNING

INJURY OR DAMAGE – The GE T2100 Treadmill is too heavy to lift, lower or move safely by one person. Serious bodily injury or damage to the GE T2100 Treadmill may result.

A minimum of two people are required when lifting, lowering or moving the GE T2100 Treadmill.

1. Lift the end of the bed assembly to about knee height, keeping knees bent and back straight as you lift.
2. Rotate the GE T2100 Treadmill in the direction you want to go (the GE T2100 Treadmill will pivot on its wheels) and push forward.



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3. When you have maneuvered the GE T2100 Treadmill into its new location, gently lower the end of the bed assembly to the floor.

Installation Checklist

The Installation Checklist is provided as a guide for the field engineer when installing a GE T2100 Treadmill. Follow the procedures in this instruction in the order that they are written and appear.

As you complete each item, check it off in the list below.

- “Domestic Electrical Safety Tests” on page 3-5
- Assemble the GE T2100 Treadmill:
 - ◆ “Pre-Assembly Inspection” on page 3-6
 - ◆ “Install Handle Set” on page 3-6
 - ◆ “Install Emergency Stop Switch” on page 3-8
- “Ground Continuity Test” on page 3-9
- “Connect Controlling Devices” on page 3-9
- “Check Emergency Stop Switch” on page 3-10
- “Check Walking Belt Tension and Tracking” on page 3-10
- “Secure the Cables” on page 3-10
- “Self-Calibration” on page 3-10
- “Check GE T2100 Treadmill Level” on page 3-12
- “Leakage Tests” on page 3-12
- “Functional Checkout” on page 3-15
- “Double-Check Handles” on page 3-17

Domestic Electrical Safety Tests

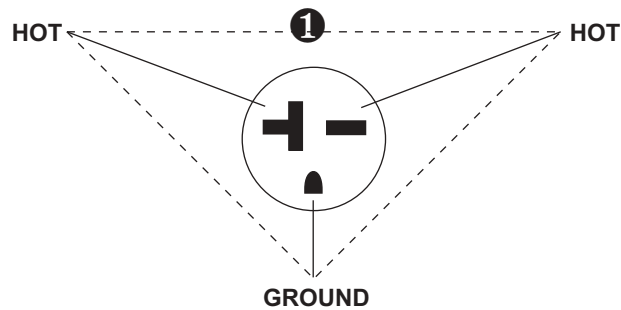
AC Line Voltage Test

This test verifies that the domestic wall outlet supplying power to the equipment is properly wired. For international wiring tests, refer to the internal standards agencies of that particular country.

200 to 240 VAC, 50/60 Hz

Use a digital voltmeter set to measure at least 300 VAC to check the voltages of the NEMA 6-20R AC wall outlet (U.S. domestic only, or applicable international connection; dedicated circuit recommended). If the measurements are significantly out of range, have a qualified electrician repair the outlet. The voltage measurements should be:

200 to 240 nominal VAC between the two “hot” contacts.



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NOTE

For proper and safe operation of the GE T2100 Treadmill, ensure the power source is clean. See [“Power/Environmental Specifications”](#) on page A-4 for more details.

Equipment Assembly

The GE T2100 Treadmill ships completely assembled except for the handle set and the emergency stop switch.

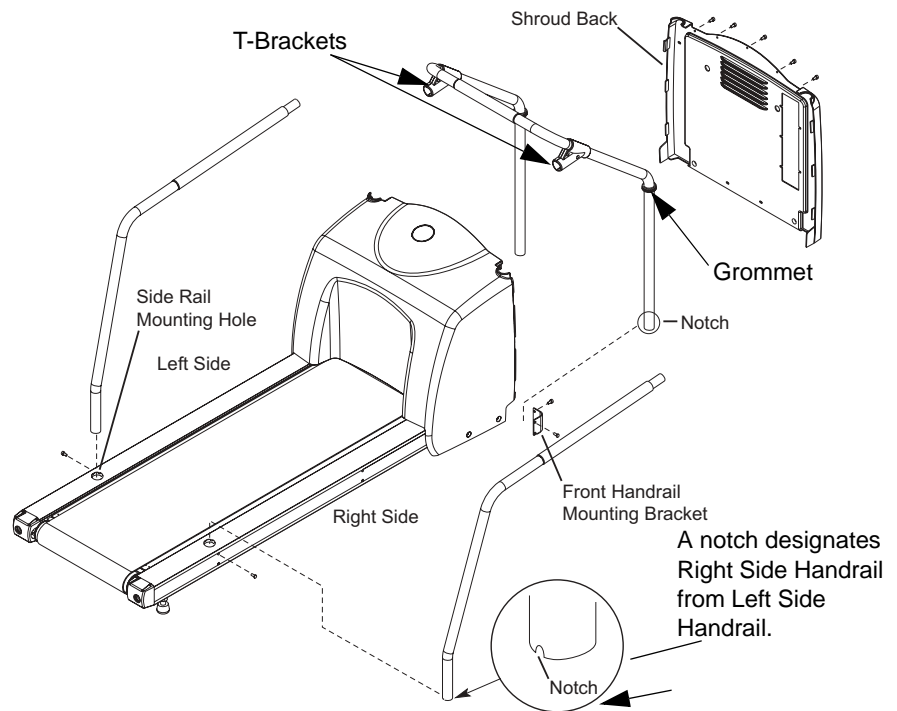
As recommended by the American Heart Association Exercise Standards (Special Report, Vol 82, No 6), the GE T2100 Treadmill should have front and side rails installed for patients to steady themselves. An emergency stop switch must be visible and readily accessible. Attach the handle set and emergency stop switch BEFORE applying power to the unit.

Pre-Assembly Inspection

1. If connected, disconnect the power cord from the rear connector panel.
2. Remove the screws on the shroud back and remove the back panel and visually inspect the following:
 - a. **Drive Belt** – The drive belt is correctly adjusted at the factory, but may have changed during shipping. Before operating the GE T2100 Treadmill, verify the tension of the drive belt. See “**Drive Belt Adjustments**” on page 7-16 for proper tension tolerances.
 - b. **Drive Motor Mount** – Verify that the mounting bolts are securely tightened.
 - c. **Harnesses** – Verify that all wiring harnesses are securely attached.
 - d. **Elevation Rack** – Verify that no obstructions are present in the elevation racks.

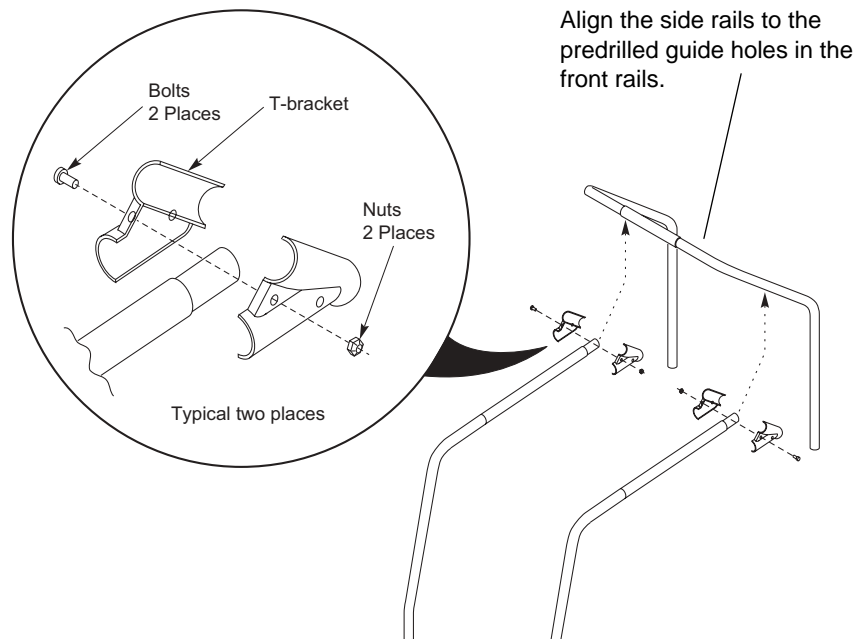
Install Handle Set

1. Insert the wood front handrail into the metal side rails, then align the pre-drilled holes and screw in the two Phillips screws on both sides. Assemble the side rails in the same way.
2. Install the two grommets on the front rail assembly.
3. Place the assembled front handrail into the metal mounting brackets on the front corners of the shroud. Using the supplied Allen wrench and four bolts, secure the handrail to the brackets.
4. Place the assembled side rails into the side mounting holes and screw in the two bolts on each side. Refer to the drawing below for designation of right side and left side handrails.



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5. Attach the side rails to the front rail with the mated T-brackets. Tighten the two T-bracket bolts with the Allen wrench.
6. Make sure all screws and bolts are seated properly and no sharp edges are present.
7. Reassemble the shroud and align the grommets properly.



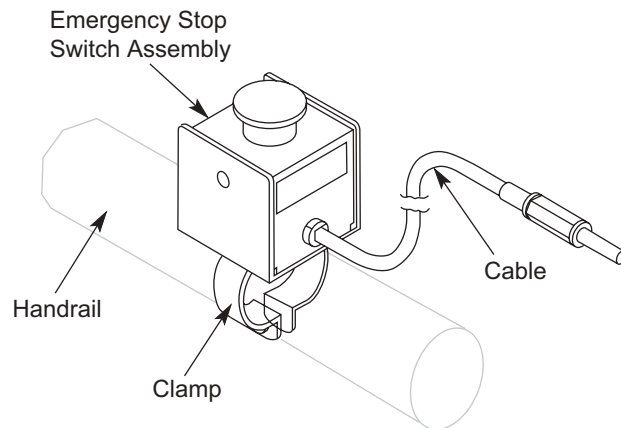
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Install Emergency Stop Switch

NOTE

The emergency stop switch must be installed and the ESTOP cable plugged in to the GE T2100 Treadmill connection panel for the GE T2100 Treadmill to operate. If the ESTOP is not installed, the GE T2100 Treadmill will not operate.

1. Attach the two clamp pieces to the assembled, latching emergency stop switch.



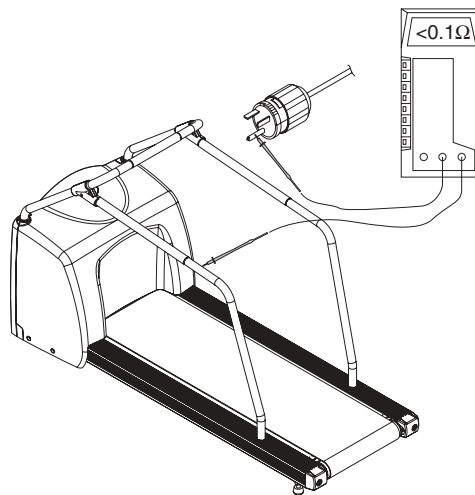
2. Position the clamps around the GE T2100 Treadmill front handrail and secure with the supplied screw and nut. The emergency stop switch can be mounted in different locations and positions based on customer preference.
3. Connect the cable from the emergency stop switch to the connection on the GE T2100 Treadmill's rear connector panel. (See "[Connection Panel](#)" on page 2-7 for connection locations.)
4. Use the cord clips to attach the cable along the front handrail and secure the excess cable.

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Ground Continuity Test

This test verifies that there is continuity (less than 100 mΩ resistance) between all the exposed metal surfaces, which have the potential to become energized, and the ground prong on the mains AC power cord. Look for an exposed metal screw, or, if the metal surfaces are anodized or painted, scrape off a small area in an inconspicuous area on the aluminum casting, for the probe to make direct contact with the metal.

1. Connect the AC power cable to the GE T2100 Treadmill.
2. Use a digital multimeter to check all the metal surfaces of the equipment as illustrated below. Make adjustments for any resistance in the test leads.



020

If the measurements are significantly out of range, check for breaks in the power cord or in the internal connections within the unit.

Connect Controlling Devices

1. Attach the appropriate controller cable from the stress system or MTC-1. Use the supplied interface cable to connect the GE T2100 Treadmill to the host (i.e., CASE, MTC-1).

NOTE

The CASE and MAC 5000ST are connected to the RS 232 Serial Port, and the MTC-1 is connected to the RS 422 Serial Port.

NOTE

On the CASE system, connect the GE T2100 Treadmill interface cable in one of the following ports: COM 1, COM 2, COM C or COM D. The CASE RSS modem requires the use of either COM 1 or COM 2. Move the GE T2100 Treadmill interface cable to COM C or COM D only as necessary.

2. Verify that the emergency stop switch is connected.
3. Connect the AC power cord.

4. Turn the GE T2100 Treadmill power switch On.
5. Turn the controlling device power switch On.

Secure the Cables

Tie down cables to ensure they do not get caught in the wheels or the elevation racks.

Check Walking Belt Tension and Tracking

Operate the walking belt at various speeds and verify that it tracks evenly down the center of the walking board. If not, adjust the walking belt tracking. See [“Walking Belt Tracking and Tension Adjustment”](#) on page 4-5.

Check Emergency Stop Switch

1. Manually control the speed of the GE T2100 Treadmill from the controlling device. With the belt moving at a relatively high speed, press the emergency stop switch. The GE T2100 Treadmill belt will stop promptly but the belt will not lock, allowing for removal of foreign objects. To release the switch, turn the button 1/4-inch turn in either direction.
2. Use the controlling equipment to terminate the exercise session and turn off the GE T2100 Treadmill.

Self-Calibration

The GE T2100 Treadmill has a built-in self-calibration routine.

WARNING

INJURY TO PERSON

Keep hands, hair, jewelry, and loose clothing away from moving parts. Do not place feet under GE T2100 Treadmill during elevation changes. Otherwise, serious injury could result.

WARNING

INJURY TO PERSON - During the self-calibration process the GE T2100 Treadmill will elevate to its maximum grade. Make sure you monitor the site at all times.

Make sure there are no customers or patients on or near the GE T2100 Treadmill during self-calibration.

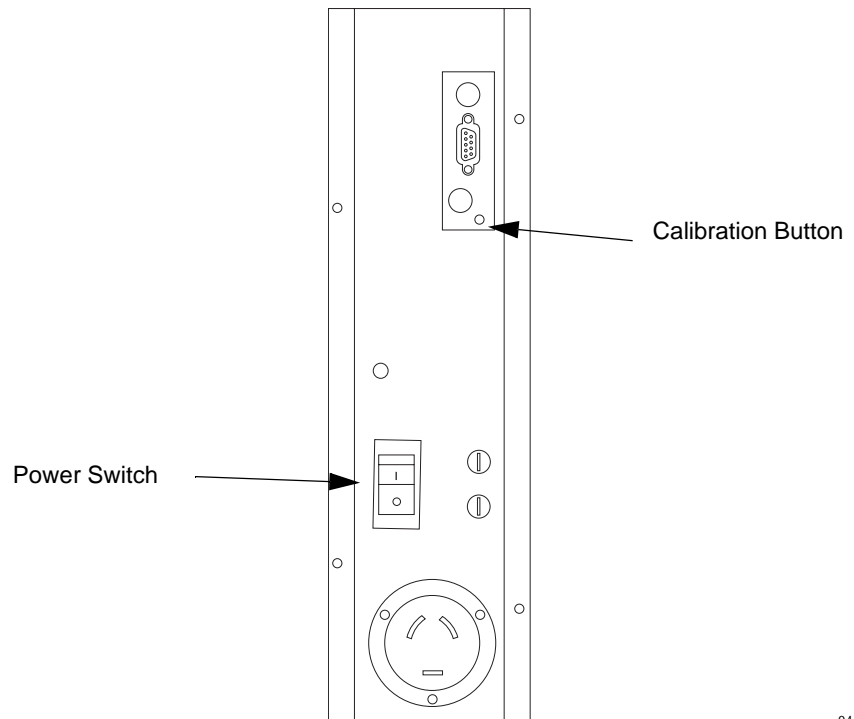
To activate the self-calibration routine, do the following:

1. Remove controlling device (CASE, MTC-1) cable or turn off the controlling device.
2. Unlock the emergency stop switch.
3. Connect the AC power cable on the GE T2100 Treadmill to the wall outlet.

WARNING

POWER CABLES – Route the AC Power cable away from moving parts. An AC power cable caught in moving parts could cause injury to the user and equipment.

4. Press and hold in the Calibration button.



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5. Turn the power switch on the GE T2100 Treadmill to On.
6. Continue to hold the Calibration button until the GE T2100 Treadmill starts changing elevation (at least 4 seconds). This initiates the self-calibration routine.
7. Wait for the self-calibration routine to complete. When the elevation and the walking belt have completely stopped (approx. 2 minutes), the self-calibration is finished.

Self-Calibration Routine

- a. The GE T2100 Treadmill checks the functionality of the elevation limit switches and the potentiometer by rising to the maximum height limit switch.
- b. The GE T2100 Treadmill sets the elevation parameters by descending to the minimum height limit switch and then rising again to the maximum height limit switch.
- c. The GE T2100 Treadmill descends to 10% grade and revolves the walking belt at 3.2 km/h (2 mph) for 30 seconds.
- d. The GE T2100 Treadmill stops the walking belt and descends to 0% grade.

Check GE T2100 Treadmill Level

NOTE

Before you check the GE T2100 Treadmill level, make sure that it has been moved to its final destination.

1. Use the controlling equipment to verify the GE T2100 Treadmill elevation is 0.0%.
2. Check the GE T2100 Treadmill level with a carpenter's level.
3. If the GE T2100 Treadmill is uneven, adjust the feet at the rear of the GE T2100 Treadmill until it is level.
4. If you cannot level the GE T2100 Treadmill safely, move it to another location.

Leakage Tests

The leakage tests are safety tests to ensure that the equipment poses no electrical health hazards. Use the table below to determine which tests apply to the unit under test and the maximum allowable leakage currents. For international leakage limits, refer to the internal standards agencies of that particular country.

If the unit under test fails the leakage tests, do not allow the customer to use the equipment. Call Tech Support for assistance. (See the “How to Reach Us” page in the front of the manual.)

GE Medical Systems *Information Technologies* recommends that you perform these tests:

- ◆ Before applying power for the first time
- ◆ Whenever internal assemblies are serviced

NOTE

The accuracy of the leakage tests depends on a properly-wired wall outlet. Do not proceed until you verify the integrity of the power source.

WARNING

Total system leakage current must not exceed 300 microamperes.

Table 1. Leakage Tests and Maximum Allowable Leakage Currents

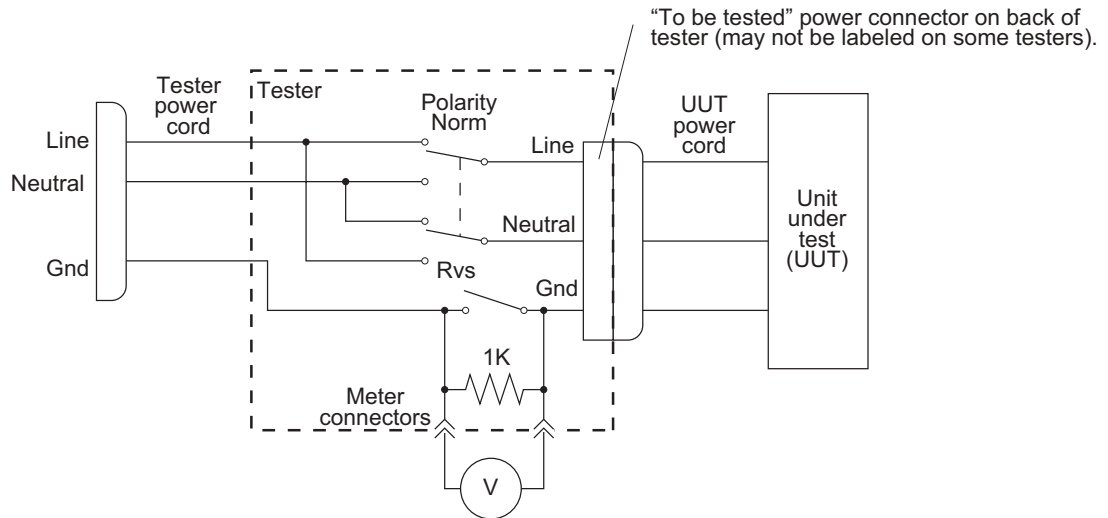
Test	Applies To	Maximum Current (μA)
1 Ground-wire-leakage-to-ground	GE T2100 Treadmill	Gnd open = 1000
2 Chassis-leakage-to-ground	GE T2100 Treadmill	Gnd open = 500 Gnd closed = 100

Leakage Test Diagrams

These diagrams show only a representation of how a typical leakage current tester functions. Follow the instructions provided with the leakage current tester that you use.

Test #1

Ground-Wire-Leakage-to-Ground

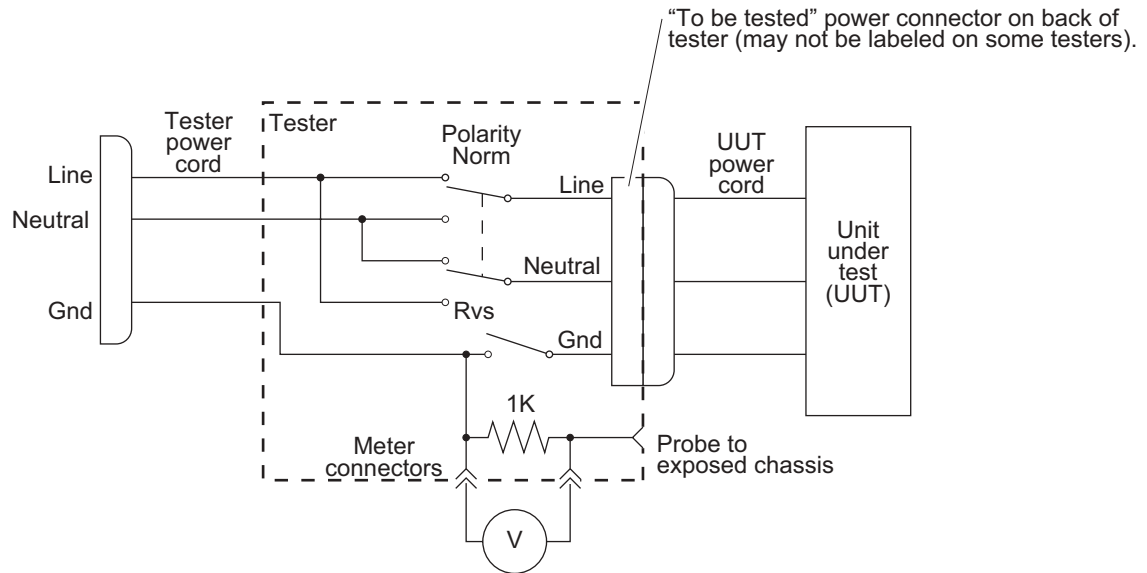


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Test #2

Chassis-Leakage-to-Ground (Exposed Chassis)

Apply line voltage to the UUT chassis for this test.



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Functional Checkout

Functional Checklist

Perform each of the functional checkout procedures below and verify that the GE T2100 Treadmill passes each procedure before operating this treadmill.

Procedure	Indicate Pass/Fail	If Failed, perform the following:	Indicate Pass/Fail
AC Power Check. See "AC Line Voltage Test" on page 3-5.		Contact site electrician to correct.	
Ground Continuity Test. See "Ground Continuity Test" on page 3-9.		Contact site electrician to correct.	
Check Power Up - Turn on GE T2100 Treadmill <ul style="list-style-type: none"> ■ Is the outlet tight in the wall? ■ Does the plug feel tight when inserted into the outlet? 		Verify that the ESTOP is connected. The GE T2100 Treadmill will not power up if the ESTOP is not connected. Contact site electrician to correct. Contact site electrician to correct.	
Check Calibration <ul style="list-style-type: none"> ■ Can the unit elevate? ■ Can the walking belt move with power? ■ Speed check at 3 m.p.h. = 10 revs in 38 seconds. (Adhere a piece of tape to the walking belt and count 10 revs of the tape in 38 seconds.) ■ Is the walking belt tracking evenly down the center of the walking board? ■ Check the walking belt tightness. Get on the GE T2100 Treadmill and try to stop the belt at a slow speed with your feet, holding onto the handrail. 		<ol style="list-style-type: none"> 1. Initiate the self-calibration procedure. See "Self-Calibration" on page 3-10. 2. Follow the troubleshooting procedure for error code 0x03 in "TDU Troubleshooting Table" on page 6-17. <ol style="list-style-type: none"> 1. Is the Emergency Stop Switch locked? If yes, unlock. 2. Initiate the self-calibration procedure. See "Self-Calibration" on page 3-10. 3. Follow the troubleshooting procedure for error code 0x02 in "TDU Troubleshooting Table" on page 6-17. Initiate the self-calibration procedure. See "Self-Calibration" on page 3-10. Adjust belt tracking. See "Walking Belt Tracking Adjustment" on page 4-6. Adjust the belt tension. See "Walking Belt Tension Adjustment" on page 4-5.	
Check GE T2100 Treadmill Level			

Procedure	Indicate Pass/Fail	If Failed, perform the following:	Indicate Pass/Fail
<ul style="list-style-type: none"> ■ Is the unit level and stable. ■ Is the floor under the unit smooth and with no loose tiles? 		<p>If unit is not level, adjust. Relocate the GE T2100 Treadmill.</p>	
<p>Check the drive belt tension and tracking See "Drive Belt Adjustments" on page 7-16 for specific tension and tracking tolerances.</p>		<ol style="list-style-type: none"> 1. Adjust the drive belt tension and tracking. See "Drive Belt Adjustments" on page 7-16. 2. Call tech support. 	
<p>Check Emergency Stop (ESTOP) Switch</p>		<ol style="list-style-type: none"> 1. If belt does not stop, make sure emergency stop switch is connected to back of the GE T2100 Treadmill. 2. Call tech support. 	
<p>Check Handles Refer to "Double-Check Handles" on page 3-17.</p>		<p>Tighten handle fasteners.</p>	
<p>Communicate with Host</p> <ul style="list-style-type: none"> ■ Can Host control elevation and speed? 		<ol style="list-style-type: none"> 1. Check that interface cable is properly connected. 2. Replace Interface cable. 3. Use the GE T2100 Treadmill Diagnostic Utility (TDU) to help troubleshoot the problem. See "GE T2100 Treadmill Diagnostic Utility (TDU)" on page 6-9. 	
<p>Noise and Vibration</p> <ul style="list-style-type: none"> ■ Vibration ■ Rattling or Growling ■ Thumping ■ Squealing or Grinding ■ Squeaking 		<p>See "Location of Major Sub-Assemblies" on page 7-4 to identify these assemblies.</p> <ol style="list-style-type: none"> 1. Check drive belt and walking belt tension. See "Walking Belt Tracking and Tension Adjustment" on page 4-5. 2. Check for loose bolts and broken welds. 3. Check the fly wheel. 4. Check the drive pulley on motor. 5. Make sure the roller assembly bolts are tight. <ol style="list-style-type: none"> 1. Check for loose bolts. 2. Check lithium grease on elevation racks. 3. Check drive motor and elevation motor. <p>Check drive belt and walking belt tension. See "Walking Belt Tracking and Tension Adjustment" on page 4-5.</p> <ol style="list-style-type: none"> 1. Check drive motor and elevation motor. 2. Check elevation rack. <ol style="list-style-type: none"> 1. Check for split walking board. 2. Check drive motor and elevation motor. 	

Procedure	Indicate Pass/Fail	If Failed, perform the following:	Indicate Pass/Fail
■ Rhythmic Rubbing		Check that walking board is level to the top surface of the rollers.	
Leakage Test Was leakage test performed by Biomed and did it pass?		Request Biomed to perform Leakage Test. See "Equipment Assembly" on page 3-6.	

Double-Check Handles

Check to make sure all handles are secure. Verify that all screws on the handles are fastened securely.

For your notes

4 Maintenance

For your notes

Introduction

Recommended Maintenance

A regular equipment maintenance program helps prevent unnecessary equipment and power failures and also reduces possible health hazards.

To help you establish a systematic maintenance routine, GE Medical Systems *Information Technologies* recommends that you periodically perform the maintenance and test procedures described in this manual, including:

- “**Inspection and Cleaning**” on page 4-4.
- “**Walking Belt Tension Adjustment**” on page 4-5.
- “**Walking Belt Tracking Adjustment**” on page 4-6.
- “**Self-Calibration**” on page 3-10.
- Check the handles and tighten the fasteners.
- Test the emergency stop switch.

NOTE

Unless you have an Equipment Maintenance Contract, GE Medical Systems *Information Technologies* does not in any manner assume the responsibility for performing the recommended maintenance procedures. The sole responsibility rests with the individual or institution using the equipment. GE Medical Systems *Information Technologies* service personnel may, at their discretion, follow the procedures provided in this manual during visits to the equipment site.

Required Tools and Supplies

See “**Required Tools and Supplies**” on page 7-3 for a complete list of tools.

Inspection and Cleaning

Visual Inspection

Regularly inspect the AC power cord and all other cords and cables for fraying or other damage. Perform safety tests on any repaired cords.

Inspect all plugs, cables and connectors for bent prongs or pins. Verify that all cords, socketed components, and connectors are securely seated.

Inspect the following for excessive wear or damage:

- Walking belt
- Drive belt
- Handrail and hardware

Exterior Cleaning

Turn the GE T2100 Treadmill system off. Clean the exterior surfaces with a clean, soft cloth and a mild dishwashing detergent diluted in water. Wring out the excess water from the cloth and take care not to drip solutions on the e-box connections and ports. (Use antiseptic cleaner on the handrails and walking belt.) Avoid contact with open vents, plugs or connectors. Dry the surfaces with a clean cloth or paper towel.

Interior Cleaning

Complete any pre-service procedures prior to opening the unit or performing any interior cleaning. Clean the unit as needed, but at least once per month.

Walking Belt Tracking and Tension Adjustment

WARNING

Keep hands, hair, jewelry, and loose clothing away from moving parts.

When to Adjust

The GE T2100 Treadmill walking-belt tension is set at the factory. However, you should test the belt tracking every time the GE T2100 Treadmill is moved. Run the GE T2100 Treadmill for several minutes with no one exercising. If the belt tracks to one side or the other, then you must adjust the belt tracking.

It is not unusual for the GE T2100 Treadmill belt to move slightly off center while a person with a heavy gait is exercising. A properly adjusted belt re-centers itself when the person steps off the GE T2100 Treadmill. If the belt does not re-center, check the GE T2100 Treadmill level and adjust the belt tracking as described.

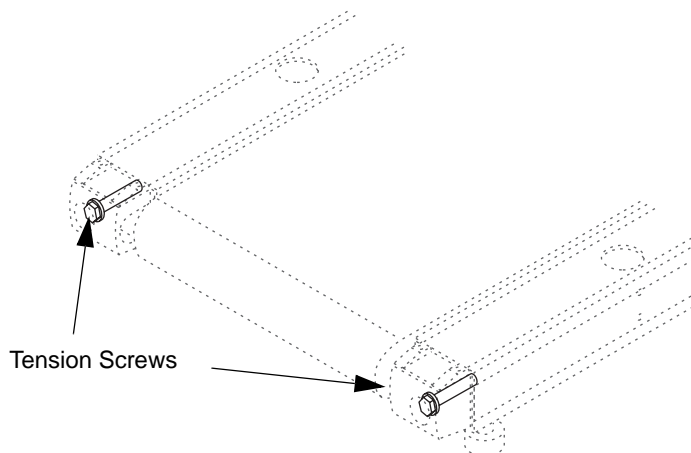
Walking Belt Tension Adjustment

1. Use the controlling equipment to set the walking belt speed to 3 – 5 km/h (2 – 3 mph).
2. Hold on to the handrails, mount the GE T2100 Treadmill, and begin walking at a normal pace.
3. Hold on to the handrails tightly and step harder and heavier onto the walking belt, adding more pressure and weight.

NOTE

The belt tension should be just enough to keep the belt from slipping.

4. Adjust the tension bolts until the walking belt does not slip.



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Walking Belt Tracking Adjustment

1. Use the controlling equipment to set the walking belt speed to 7 – 8 km/h (4 – 5 mph).
2. To correct a belt that tracks to the right, turn the right pulley adjustment screw **CLOCKWISE** in 1/8-turn increments until the belt tracks in the center. Wait 2 or 3 minutes between each 1/8-turn to allow the belt position to stabilize.

To correct a belt that tracks to the left, turn the left pulley adjustment screw **CLOCKWISE** in 1/8-turn increments until the belt tracks in the center. Wait 2 or 3 minutes between each 1/8- turn to allow the belt position to stabilize.

NOTE

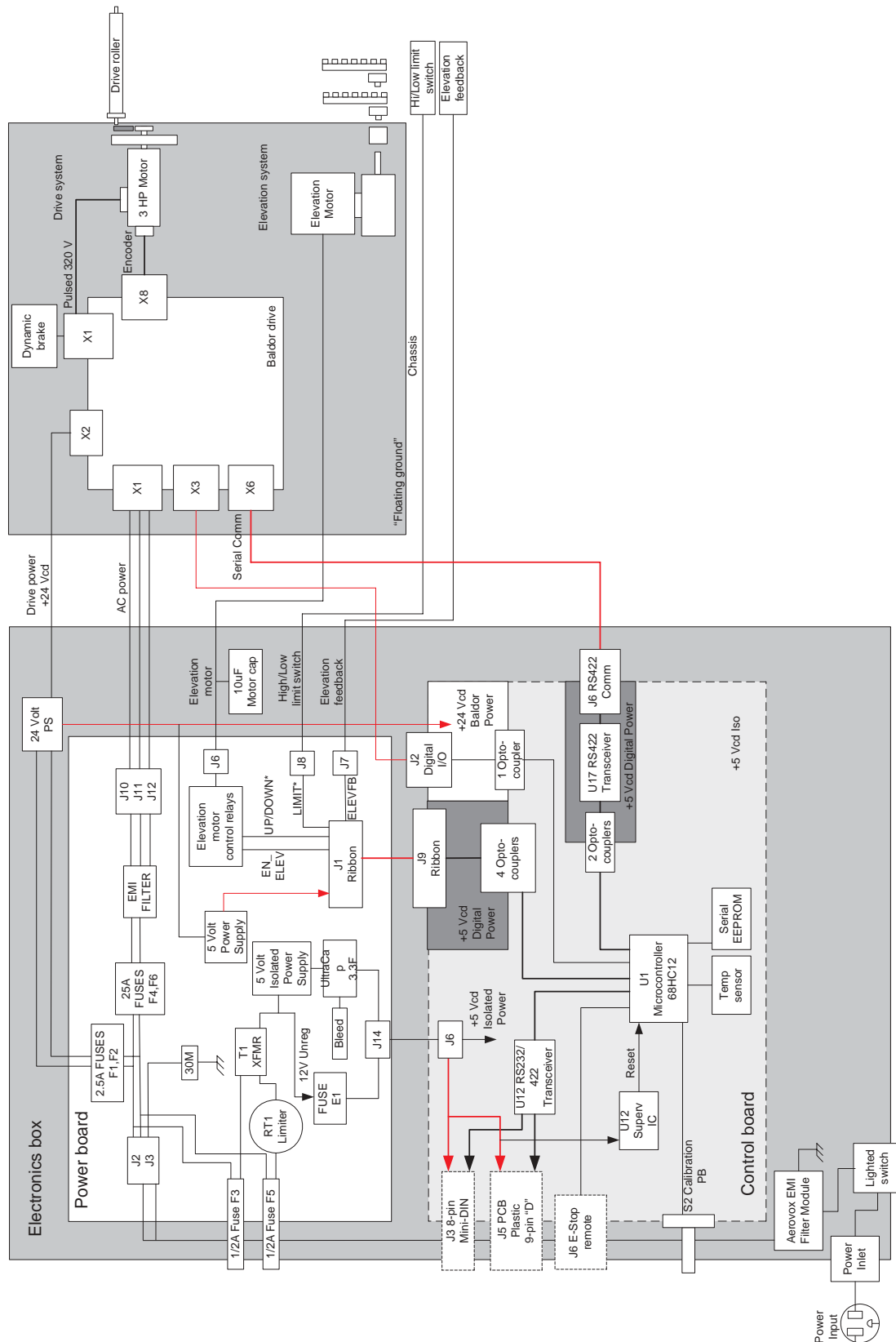
Make adjustments to the pulley screws in small increments. Over-adjustments and repeated tightening of the screws can cause too much tension on the belt.

3. If either adjustment in step 2 results in an over-adjustment of the belt tracking, loosen the pulley screw that was tightened and wait several minutes for the GE T2100 Treadmill belt position to stabilize. Then tighten the other pulley adjustment screw.
4. Increase the speed to 16 – 19 km/h (10 – 12 mph) and verify that the belt continues to track in the center.
5. Check the walking belt tension again to verify that it has not been loosened when adjusting the tracking. See [“Walking Belt Tension Adjustment”](#) on page 4-5.

5 Theory of Operation

For your notes

GE T2100 Treadmill Block Diagram



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Power Board (PCB) Theory

General Description

The power board and processor board function together as part of the e-box to control the GE T2100 Treadmill. The power board contains the following:

- Mains components
- Isolation transformer
- Elevation and drive interface circuitry
- Interface to processor board

Precautions

Handling of this power board or harness should be done by qualified service personnel observing customary EST protections procedures.

Initial Board Conditions

The power board initial conditions are all at 0V.

Power Input Requirements

The GE T2100 Treadmill is used on single phase AC. The specific power ratings are 200-240VAC, 50-60 Hz, 16A.

Power Distribution/Isolation

The power board receives 200 to 240VAC power (nominal 220V). The isolation transformer supplies 12V to two switching regulators. The switching regulators supply +5V to both the isolated side and the non-isolated side of the processor board. Bypass caps are distributed across the board to minimize EMI and power supply noise.

Power Inlet, Drive Power Outlet & Mains

The power comes in on the terminal block, gets fused and filtered, and is distributed to the isolation transformer, out to the drive system and to a +24V power supply. Externally accessible 0.5ASB fuses are provided for the control portion of the circuitry. A 2.5 Amp internal fuse is dedicated to protecting the +24V power supply. The 25 Amp internal fuses are for the drive section and are intended to protect the wiring from major faults within the drive system. Spacings for creepage and isolation are critical in this whole section.

Power Supplies

There are two identical power supplies. One is for the microcontroller power and the serial link, the other is for signal interface to the control drive. The isolated serial link supply provides 5-volt power to operate a manual controller and the control circuitry on the processor board.

Unregulated power for the isolated power comes from the center tapped isolation transformer, the non-isolated power comes from the 24V power supply. These are both fed through the full-wave bridge to the switching regulator.

The switching regulator is a step-down, buck PWM-type that switches at about 100 KHz. It also has an internal current limit of 4 amps. The 5-volt regulators are configured to produce about 5.1 volts.

Logical Ride-Through Power

Located on the power board are 3 Ultracapacitors. They are fed by the isolated switching power supply. These capacitors provide 3.3 Farads of capacitance that give the processor board power to logically power down activities in case of a loss of power to the GE T2100 Treadmill.

Processor Board Connectors

The power board has two connectors that directly interface with the processor board. The first, a 3-pin power connector provides +12V Unregulated power, +5V isolated power and isolated ground to the control side of the processor board. The 10-pin ribbon cable provides a signal interface 24V power, as well as +5V non-Isolated power and a non-isolated ground connection.

Isolation Transformer

The isolation transformer provides isolation for the secondary. The 220 VAC primary is stepped down and isolated from the 12V (CT) secondary. The secondary provides +12V unregulated power for a 5-volt switching supply.

Elevation Relays

A direction control and an enable relay control the elevation motor. A change in direction should only occur when the elevation motor is stopped. The enable relay is disabled by the normally-closed limit switches at the end of travel to prevent damage to the motor. The LIMIT* signal goes low when a limit switch is activated in a particular direction.

Elevation Sensor

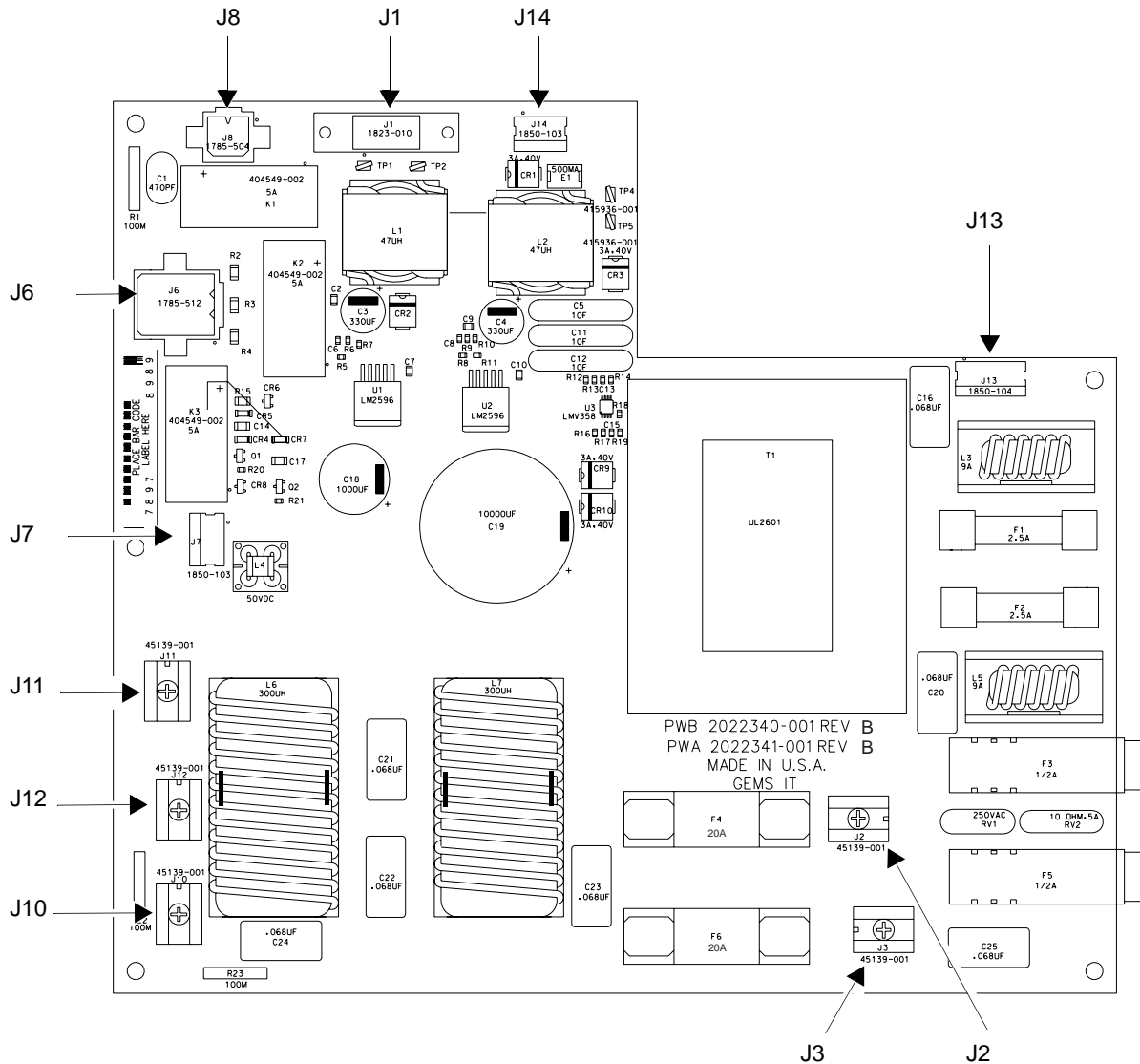
The elevation sensor is a 5-turn pot that is coupled to the elevation rack. The voltage on pin 2 should be proportional to elevation. That is, low voltage should be low elevation, increasing voltage should indicate increasing elevation. During self-calibration, the offset and gain remain in software memory. Initially, the limit switch positions are the reference for self-calibration. Once the offset and gain are adjusted, the pot position determines the elevation.

ESD and EMI Compatibility

The I/O connectors on the power board have current-limiting resistors, Zener diodes, or filtering capacitors wherever possible to prevent EMI from escaping the board. These components also limit rise-time and voltages which may come from ESD or other noise sources.

Power Board Input/Output Signal Requirements

See the illustration below for location of the J PINs.



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Table 1. J1 10-Pin Ribbon Between Power Board and Processor Board

PIN #	NAME	TYPE	IN/OUT	FREQ	COMMENT
J1-1	+5.1V	PWR	OUT	DC	Digital Power Supply
J1-2	DGND	COM	OUT	DC	Digital Ground Supply

J1-3	EN_ELEV	LOGIC	IN	PULSE	Elevation Enable Control
J1-4	DGND	COM	OUT	DC	Digital Ground Supply
J1-5	LIMIT*	LOGIC	OUT	PULSE	Limit Switch Feedback
J1-6	DGND	COM	OUT	DC	Digital Ground Supply
J1-7	ELEV_FB	A	OUT	DC	Pot Elevation Feedback
J1-8	DGND	COM	OUT	DC	Digital Ground Supply
J1-9	UP/DOWN*	LOGIC	IN	PULSE	Elevation Direction Controls
J1-10	+24V	PWR	IN	DC	Digital Power Supply

Table 2. J2, J3 Power in from EMI Filter

PIN #	NAME	TYPE	IN/OUT	FREQ.	COMMENTS
J2-1	LINE	PWR	IN	50-60 Hz	Line Power In
J3-1	LINE	PWR	IN	50-60 HZ	Line Power In

Table 3. J6 Elevation Motor Power Cable

PIN	NAME	TYPE	IN/OUT	FREQ.	COMMENTS
J6-1	220V_UP	PWR	OUT	50-60 Hz	Power Up Elevation
J6-2	NC	NC			NC
J6-3	220V_DN	PWR	OUT	50-60 Hz	Power Down Elevation
J6-4	220V_UP	PWR	OUT	50-60 Hz	Power Up Elevation
J6-5	NC	NC			NC
J6-6	220V_DN	PWR	OUT	50-60 Hz	Power Down Elevation
J6-7	NC	NC			NC

Table 3. J6 Elevation Motor Power Cable

J6-8	NC	NC			NC
J6-9	NC	NC			NC
J6-10	220V_ELEV	PWR	OUT	50-60 Hz	220V Power to Motor
J6-11	NC	NC			NC
J6-12	GND	COM	OUT	DC	Elevation Ground

Table 4. J7 Elevation Feedback Cable

PIN #	NAME	TYPE	IN/OUT	FREQ.	COMMENTS
J7-1	+5VQ	PWR	OUT	DC	Quiet Power to Pot
J7-2	ELEV_FB	A	IN/OUT	DC	Pot Elevation Feedback
J7-3	QGND	GND	OUT	DC	Quiet Ground to Pot

Table 5. J8 Limit Switch Feedback Cable

PIN #	NAME	TYPE	IN/OUT	FREQ.	COMMENTS
J8-1	LIMIT PULSE	PULSE	IN	DC	Normally Closed
J8-2	LIMIT PULSE	PULSE	IN	DC	Normally Closed
J8-3	HIGH_LIMIT_SWITCH	PULSE	IN	DC	High Limit Switch
J8-4	LOW_LIMIT_SWITCH	PULSE	IN	DC	Low Limit Switch

Table 6. J10, J11, J12 AC Power to Drive Controller

PIN #	NAME	TYPE	IN/OUT	FREQ.	COMMENTS
J10-1	GND	COM	OUT	DC	Ground
J11-1	LINE	PWR	OUT	50-60 Hz	Line Power Out
J12-1	LINE	PWR	OUT	50-60 Hz	Line Power Out

Table 7. J13 AC Power to +24V Power Supply

PIN #	NAME	TYPE	IN/OUT	FREQ.	COMMENTS
J13-1	LINE	PWR	OUT	50-60 Hz	Line Power Out
J13-2	NC	NC			NC
J13-3	NC	NC			NC
J13-4	LINE	PWR	OUT	50-60 Hz	Line Power Out

Table 8. J14 Power Cable to Processor Board

PIN #	NAME	TYPE	IN/OUT	FREQ.	COMMENTS
J14-1	+5V ISO	PWR	OUT	DC	ISO Power Supply
J14-2	ISOGND	COM	OUT	DC	ISO Ground Supply
J14-3	+VUNREG	PWR	OUT	DC	ISO Power Supply

Processor Board (PCB) Theory

General Description

The processor board and power board function together to control the GE T2100 Treadmill. The processor board contains the following:

- ◆ Micro-controller CPU circuitry (MC9S12DG128)
- ◆ Flash Memory (calibration/history data)
- ◆ Temperature sensor
- ◆ Serial control links
- ◆ I/O circuitry

The I/O circuitry receive inputs from a stress system controller along with feedback from the GE T2100 Treadmill sensors to control the elevation and drive relays located on the power board.

Power Distribution

The processor board receives two sources of 5-volt power from the power board: an isolated supply, and a non-isolated supply. Bypass caps distributed across the board minimize EMI and power supply noise.

Clock Generator

A 16.00 MHz oscillator in a colpitts configuration is used to provide the processor clock. This configuration creates a small amplitude (1 V_{p-p}) sinusoid mounted on a DC bias level to minimize EMI.

Reset Generator

The reset/watchdog/power-loss signal generator will reset the CPU if any of the five conditions below occur:

1. Upon receipt of the "BREAK" signal for more than 3.3 seconds over the host serial port, the 100K/0.33uF RC will discharge sending a low level at the MR* input and creating the RESET* signal.
2. If the 5V (+/- 2%) supply falls below 4.55, RESET* will be activated.
3. If the CPU fails to reset the watchdog timer before 1.6 seconds, the RESET* will be activated. The Firmware has the watchdog control task separated from the other systems tasks through its real time operating system (RTOS) to help guarantee that all tasks are running.
4. If the **ESTOP** plug is disconnected from the jack mounted on the processor board a RESET* signal will be generated.
5. Manual reset.

Processor Circuitry

The MC9s12DG128 runs at 16 MHz with an internal bus clock of 8 MHz. Its code is stored in the 128 KB Flash EPROM. The MC9s12DG128 addresses its memory internally. The processor handles all the I/O, including two serial channels, 4 analog inputs, and digital inputs and outputs to control the GE T2100 Treadmill grade, speed, calibration and ESTOP processes.

Analog Inputs

Ratiometric Inputs

Elevation feedback (from the pot), +5.1V ISO ref, VUNREG ref are designed to take ratiometric voltages referenced to +5.1V ISO as inputs to the processor.

Temperature Sensor

The processor monitors temperature and saves peak temperature in EEROM data storage for use by field service. The sensor outputs 10mV/deg C. The OPAMP provides a gain of 4.92. The MC9s12DG128 ADC will produce the following output:

- In hardware
 - ◆ $\text{ADC value} = \text{Temp}(\text{deg C}) * 10\text{mV/deg C} * \text{GAIN} * [256(\text{max ADC counts})/\text{VREF}]$
- In firmware
 - ◆ $\text{Readout temp} = (\text{ADC value}) * 4 / 10$
 - ◆ For example:
 - At 25 degrees Celsius
 - $\text{ADC value} = 25 * 0.01 * 4.92 * 256 * /5.1 = 62 \text{ (Dec)}$
 - $\text{Readout temp} = 62 * 4 / 10 = 24.8$
 - At 100 degrees Celsius
 - $\text{ADC value} = 100 * 0.01 * 4.92 * 256 * /5.1 = 247 \text{ (Dec)}$
 - $\text{Readout temp} = 247 * 4 / 10 = 98.8$

RS-232/422 Interfaces

The LTC1334 serves as the Host to IFC board transceiver. It translates the RS422/232 serial protocol voltage levels to TTL levels. The MAX489 is the transceiver for the processor board to drive communication. It translates RS422 signals to proper TTL levels.

ESD and EMI Compatibility

The connectors on this board have current limiting resistors and filtering capacitors on almost every signal to prevent EMI from escaping this board. These components also limit rise-time and voltages which may come from ESD or other noise sources.

Isolation

The drive serial communication circuit, drive, and elevation control signals share a common ground that may be attached to the chassis. The Host serial communication, ESTOP connection, calibration button, and control circuitry are all placed on isolated power. This ground allocation separates the micro controller ground from the chassis ground by using opto-couplers allowing at least 4KVAC without breakdown and double isolation for 250 VAC

Operation

The processor board's main task is to monitor the proper GE T2100 Treadmill operation by testing selected variables from the system. In case of any variable operating out of specs, the firmware will first detect the event, then log it, and finally stop any further operation. For speed control, the processor board will act as a translator between the host and the drive system. For elevation control, the board will act as a controller by providing proper calibration and by handling elevation increment/decrement commands received via the host serial port.

Start-Up Sequence

Immediately after power-up, the processor board will start a self-test procedure where the following subsystems are tested: internal RAM, board temperature, external serial flash memory, host communication, drive communication, control signals, elevation, power supply, ESTOP, and calibration. If any of the above tests result in an abnormal condition, the processor board will stop any further operation and will log the condition on its external flash memory. After all subsystems are determined to be operating properly, the processor board will enter in a standby state until a serial command is received from the host. The processor board will wait until the host sends a belt start command "B<CR>" to start operations. After receiving the belt start command, the board will enable the drive by activating the D_DRIVE_EN signal on J2. After this action, the drive will be activated and in standby state. At this moment elevation and speed control commands can be sent to the processor board.

Elevation Control

The elevation control process works as follows: The host will send an elevation command "GXXX0<CR>" to the processor board, the micro controller will interpret this data in order to enable the elevation

subsystem by asserting EN_ELEV signal on J9 and, based on the actual elevation status, assert/de-assert the UP/DOWN* signal on J9 until the requested elevation is achieved. The elevation range is from 0 to 25% grade.

Speed Control

The host will send a speed command "SXXX0<CR>" to the processor board, the firmware in the micro controller will translate this command into a data frame, It will enable the drive if it is not already enable at this moment, and will send the frame through its drive serial interface. The drive will interpret the data frame and will answer with data ACK or NACK depending on the transmission condition. The speed range is 0 to 13.5 MPH.

Self-Calibration

Press and hold the self-calibration pushbutton (located on the connection panel). Power up the treadmill and continue to hold the Calibration button until the GE T2100 Treadmill starts to elevate (approximately 4 seconds).

ESTOP

In order to operate the GE T2100 Treadmill, the ESTOP plug must be attached to its receptacle on the processor board. Failure to perform this action will initiate a RESET* sequence on the microcontroller disabling any further power up sequence. Verify that the ESTOP switch is not activated. Failure to verify this condition will cause the GE T2100 Treadmill to not operate.

Precautions

The board must be powered before signals are applied to it.

The circuitry is static sensitive. Therefore, when removing or installing boards, the power should be Off.

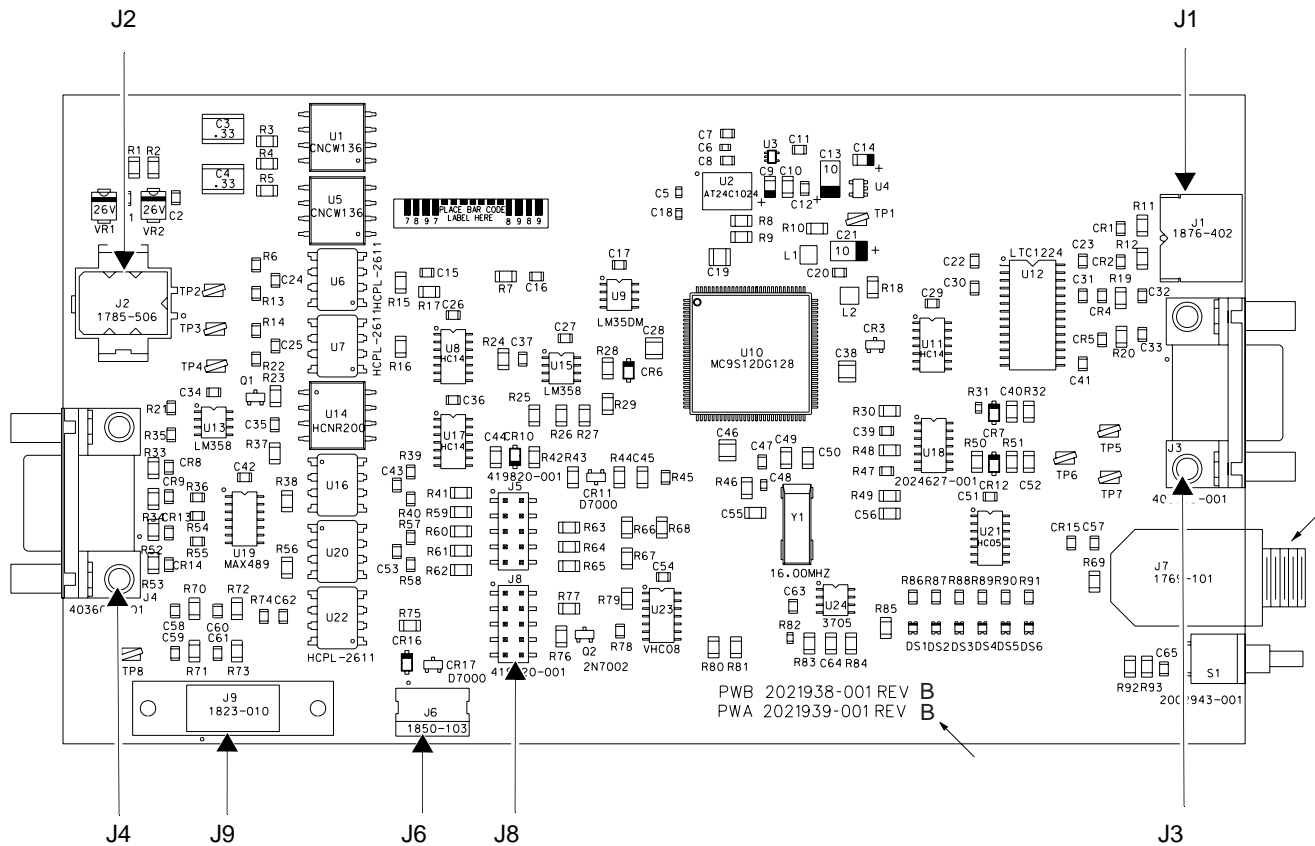
The circuit board should not be supplied with an isolated VCC over 5.5 volts on the isolated side.

Processor Board Power Input Requirements

Table 9. Power Supply Input Requirements						
Voltage	Nominal Voltage	Test Range	Max Current	Ripple p-p	Max Rating	Isolated?
+5V ISO	+5.1 VDC +/- 2%	+/- 5%	200 mA	100 mV	5.5 V	Yes
+VUNREG	+11.5 VDC unreg	NA	500 mA	NA	13.0 V	Yes
+5V DIG	+5.1 VDC +/- 2%	+/- 5%	100 mA	100 mV	5.5 V	No
+24V	+24 VDC +/- 2%	+/- 5%	600 mA	100 mV	25 V	No

Processor Board Input/Output Signal Requirements

See the illustration below for location of the J PINs.



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Table 10. J1 Host miniDIN Connector

PIN #	NAME	TYPE	IN/OUT	FREQ	COMMENT
J1-1	NC	NA	NA	NA	NA
J1-2	NC	NA	NA	NA	NA
J1-3	RXLO	RS422	IN	9600bps	Host RS422 Serial Comm
J1-4	ISOGND	COM	OUT	DC	ISO Gnd Supply
J1-5	TXLO	RS422	OUT	9600bps	Host RS422 Serial Comm
J1-6	RXHI	RS422	IN	9600bps	Host RS422 Serial Comm
J1-7	NC	NA	NA	NA	NA
J1-8	TXHI	RS422	OUT	9600bps	Host RS422 Serial Comm

Table 11. J2 Drive Signals Connector

PIN #	NAME	TYPE	IN/OUT	FREQ	COMMENT
J2-1	GND_24V	COM	IN	DC	+24V Digital Gnd Supply
J2-2	+24V	PWR	IN	DC	+24V Digital Power Supply
J2-3	GND_24V	COM	OUT	DC	+24V Digital Gnd Supply
J2-4	D_DRIVE_EN	LOGIC	OUT	PULSE	Drive Enable Signal
J2-5	GND_24V	COM	OUT	DC	+24V Digital Gnd Supply
J2-6	D_ESTOP*	LOGIC	OUT	PULSE	Deceleration eStop Signal

Table 12. J3 Host DB-9 Connector

PIN #	NAME	TYPE	IN/OUT	FREQ	COMMENT
J3-1	ISOGND	COM	OUT	DC	ISO Gnd Supply
J3-2	+5V ISO	PWR	OUT	DC	ISO Power Supply

Table 12. J3 Host DB-9 Connector

J3-3	NC	NA	NA	NA	NA
J3-4	RXLO	RS422	IN	9600bps	Host RS422 Serial Comm
J3-5	RXHI	RS422	IN	9600bps	Host RS422 Serial Comm
J3-6	+VUNREG	PWR	OUT	DC	ISO Power Supply
J3-7	ISOGND	COM	OUT	DC	ISO Gnd Supply
J3-8	TXLO	RS422	OUT	9600bps	Host RS422 Serial Comm
J3-9	TXHI	RS422	OUT	9600bps	Host RS422 Serial Comm

Table 13. J4 Drive DB-9 Connector

PIN #	NAME	TYPE	IN/OUT	FREQ	COMMENT
J4-1	NC	NA	NA	NA	NA
J4-2	RX-	RS422	IN	9600bps	Drive RS422 Serial Comm
J4-3	TX-	RS422	OUT	9600bps	Drive RS422 Serial Comm
J4-4	NC	NA	NA	NA	NA
J4-5	DGND	COM	OUT	DC	Digital Gnd Supply
J4-6	NC	NA	NA	NA	NA
J4-7	TX+	RS422	OUT	9600bps	Drive RS422 Serial Comm
J4-8	RX+	RS422	IN	9600bps	Drive RS422 Serial Comm
J4-9	NC	NA	NA	NA	NA

Table 14. J6 Isolated Power Input Connector

PIN #	NAME	TYPE	IN/OUT	FREQ	COMMENT
J6-1	+5V ISO	PWR	IN	DC	ISO Power Supply
J6-2	ISOGND	COM	IN	DC	ISO Gnd Supply
J6-3	+VUNREG	PWR	IN	DC	ISO Power Supply

Table 15. J8 BDM Connector

PIN #	NAME	TYPE	IN/OUT	FREQ	COMMENT
J8-1	BKGND	LOGIC	IN/OUT	9600bps	uC Serial Comm
J8-2	NC	NA	NA	NA	NA
J8-3	NC	NA	NA	NA	NA
J8-4	+5V ISO	PWR	OUT	DC	ISO Power Supply
J8-5	RST*	LOGIC	IN	PULSE	uC Reset Signal
J8-6	ISOGND	COM	OUT	DC	ISO Gnd Supply

Table 16. J9 Power Board to Processor Board Connector

PIN #	NAME	TYPE	IN/OUT	FREQ	COMMENT
J9-1	+5.1V	PWR	IN	DC	Digital Power Supply
J9-2	DGND	COM	IN	DC	Digital Gnd Supply
J9-3	EN_ELEV	LOGIC	OUT	PULSE	Elevation Enable Control
J9-4	DGND	COM	IN	DC	Digital Gnd Supply
J9-5	LIMIT*	LOGIC	IN	PULSE	Limit Switch Feedback
J9-6	DGND	COM	IN	DC	Digital Gnd Supply
J9-7	ELEV_FB	ANA	IN	DC	Pot Elevation Feedback
J9-8	DGND	COM	IN	DC	Digital Gnd Supply
J9-9	UP/DOWN*	LOGIC	OUT	PULSE	ELevation Direction Ctrl
J9-10	+24V	PWR	OUT	DC	Digital Power Supply

Drive Controller Theory

General Description

A brushless DC motor consists of permanent magnets that create a static magnetic field and electromagnets that, when energized, provide motion. The magnets attach to a shaft to form a rotor with an even number of magnetic poles. One or more electromagnets are wound on a laminated steel stator to form the motor phases. Typically, brushless DC motors have four, six, or eight magnetic poles with three winding phases.

With multiple motor phases, there is always one of the phases that can be energized to provide rotational torque-regardless of the rotor position with respect to the stator. Energizing the phases in the proper sequence and polarity provides constant unidirectional torque. Transistors have replaced brushes to accomplish phase switching. Sensors determine the rotor position and turn on the correct motor phase.

Phases and Power Switches

The most common arrangement of phases and power switches is the three-phase, Y-connected windings with six power switches. Each phase consists of two windings in series, spaced 120 electrical degrees apart. Each phase can be energized in either direction by turning on two of the six power devices. This arrangement of switches and motor windings is identical to an AC motor drive. The number of electrical cycles per mechanical revolution is equal to the number of rotor poles divided by two.

Motor Torque

To control motor torque, it is necessary to control the current through the motor windings since torque is directly proportional to motor current. Rapidly switching the power devices on and off limits the effective voltage applied to the motor winding. Using a feedback loop, a voltage command controls the motor current. This is called the current loop or inner loop of the drive.

Motor Speed

Control of motor torque is only half of the motor control process, since the ultimate goal of a motor drive is to provide an adjustable motor speed. The simplest speed control loop consist of a summing junction to determine the difference between the desired motor speed and the actual motor speed, along with a gain block that feeds into the current loop. The current loop may be considered a single block with voltage as an input and motor current as an output. The overall feedback loop is called the velocity loop or outer loop of the drive. While this system controls motor speed, it cannot control the exact motor speed since some error signal is

required to drive the current loop. The actual motor speed is dependent on the speed command, the load, the error gain, and the characteristics of the motor itself.

Adding an integrator to the error amplifier allows exact speed control. Any speed error results in an output from the integrator that builds with time and causes an output to the current loop. This loop, therefore, will seek zero speed error. This is the type of velocity loop used in the GE T2100 Treadmill drive.

Electrical Requirements

The two black wires that exit the side of the enclosure supply power to the drive. The power source should be single phase, 200–240VAC, 50–60Hz, 16A.

Maximum input current is 16A.

Fuses should be FLM 20A SLO only. Substituting a different fuse type may cause a fire or safety hazard.

The orange wire from the side of the enclosure is connected to the sheetmetal enclosure and should be connected to the designated terminal on the power terminal block. Do not connect this wire to the GE T2100 Treadmill frame which would cause a safety hazard.

The motor wires exit through the flexible conduit on the left side of the enclosure. These wires carry the pulsed 320V to the motor. Be sure to observe proper phasing when connecting these wires. The drive will not operate with incorrect phasing.

NOTE

If the motor is disconnected, do not let the motor wires short to each other or any other point. If it rotates, the motor will function as a generator, and it may be damaged or cause a shock hazard. The drain wire should be connected to the motor frame. Make sure this connection is secure.

For your notes

6 Troubleshooting

For your notes

Quickcheck Items

Speed and Elevation Table

Use the quickcheck chart below to identify the probable causes for problems relating to stops and hesitations for elevation, speed, and a combination of elevation and speed.

Speed and Elevation Both speed and elevation stops.	Elevation Only Elevation hesitates or seeks, and/or stops the GE T2100 Treadmill during an elevation change.	Speed Only GE T2100 Treadmill belt hesitates or stops.
<ul style="list-style-type: none"> ■ Low input voltage. Verify power source meets requirements. ■ Defective drive controller. ■ Defective power board or processor board. ■ Defective elevation potentiometer (when treadmill stops during an elevation change). ■ Defective treadmill power switch breaker (tripping). <ol style="list-style-type: none"> 1. Check the DS6 LED on the processor board. See "Processor Board Status LEDs" on page 6-15. 2. Run the "GE T2100 Treadmill Diagnostic Utility (TDU)" on page 6-9 and see the "TDU Troubleshooting Tables and Status LEDs" on page 6-15 	<ul style="list-style-type: none"> ■ Defective elevation potentiometer. ■ Misadjusted limit switches. ■ Excess rack grease affecting limit switches and or elevation potentiometer. <ol style="list-style-type: none"> 1. Check the DS6 LED on the processor board. See "Processor Board Status LEDs" on page 6-15. 2. Run the "GE T2100 Treadmill Diagnostic Utility (TDU)" on page 6-9 and see the "TDU Troubleshooting Tables and Status LEDs" on page 6-15 	<ul style="list-style-type: none"> ■ Defective drive controller. ■ Lack of wax on walking board. Check both walking board and walking belt. (Especially when the parts have not been replaced for 3 or more years. ■ Low input voltage. Verify power source meets requirements. <ol style="list-style-type: none"> 1. Check the DS6 LED on the processor board. See "Processor Board Status LEDs" on page 6-15. 2. Run the "GE T2100 Treadmill Diagnostic Utility (TDU)" on page 6-9 and see the "TDU Troubleshooting Tables and Status LEDs" on page 6-15

Emergency Stop Switch Verification

Verify that the emergency stop switch is installed and connected. The emergency stop switch (ESTOP) must be installed for the GE T2100 Treadmill to operate. If the ESTOP is not installed, the GE T2100 Treadmill will not operate.

Power Switch

When turning the GE T2100 Treadmill power switch off, there is a period of approximately 1 second when the remaining power cycles through the system. The GE T2100 Treadmill will not power up until all remaining power has cycled through the system. After turning off the GE T2100 Treadmill, wait approximately 1 second before turning the power back on.

Burn-In Mode

Burn-in mode is a repetitive cycle of elevation calibration and walking belt revolutions. It can be helpful when attempting to replicate an intermittent problem for troubleshooting.

Activating Burn-In

WARNING

INJURY TO PERSON - During the burn-in process the GE T2100 Treadmill will reach maximum elevation and speed in a repetitive cycle until power is removed. Make sure you monitor the site at all times.

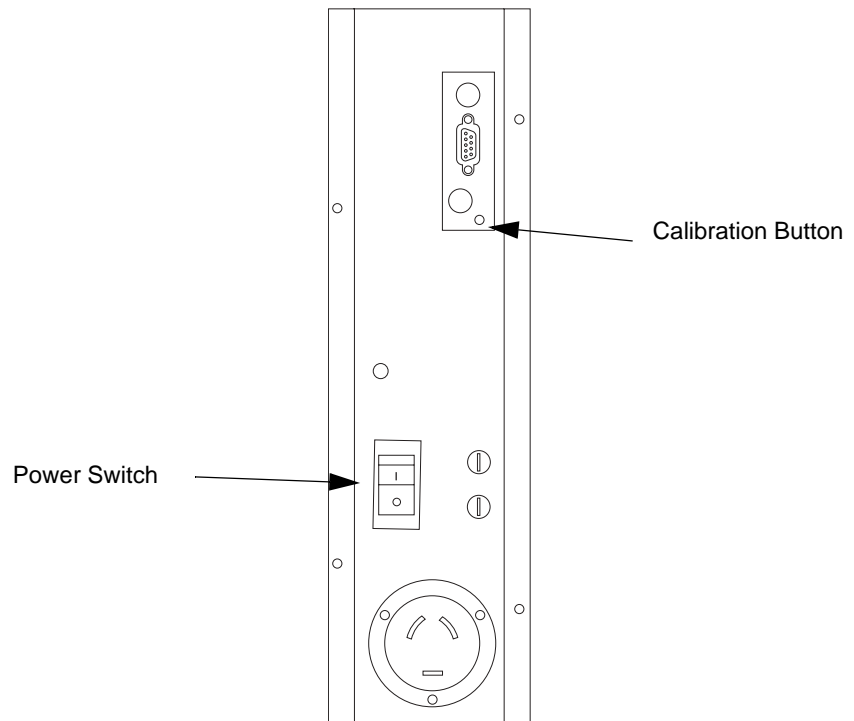
Make sure there are no customers or patients on or near the GE T2100 Treadmill during burn-in.

To activate the burn-in mode, do the following:

1. Remove controlling device (CASE, MTC-1) cable or turn off the controlling device.
2. Unlock the emergency stop switch.
3. Connect the AC power cable on the GE T2100 Treadmill to the wall outlet.

WARNING

POWER CABLES – Route the AC Power cable away from moving parts. An AC power cable caught in moving parts could cause injury to the user and equipment.



4. Press and hold in the Calibration button.
5. Turn the power switch on the GE T2100 Treadmill to On.
6. Continue to hold the Calibration button until the GE T2100 Treadmill starts changing elevation (at least 4 seconds). This initiates the calibration routine.

NOTE

The burn-in mode can only be activated while the GE T2100 Treadmill is performing a self-calibration.

7. Press the calibration button again as soon as the GE T2100 Treadmill gets to the maximum height limit switch (maximum 30 seconds) and hold until the GE T2100 Treadmill elevation starts changing again (maximum 2 seconds). This initiates the burn-in mode. The self-calibration routine must finish before the burn-in mode starts.

Self-Calibration Routine

- a. The GE T2100 Treadmill checks the functionality of the elevation limit switches and the potentiometer by rising to the maximum height limit switch.
- b. The GE T2100 Treadmill sets the elevation parameters by descending to the minimum height limit switch and then rising again to the maximum height limit switch.
- c. The GE T2100 Treadmill descends to 10% grade and revolves the

walking belt at 3.2 km/h (2 mph) for 30 seconds.

Burn-In Routine

- a. The GE T2100 Treadmill elevates to 25°.
- b. The GE T2100 Treadmill elevates to 0°.
- c. The GE T2100 Treadmill elevates to 10°.
- d. The GE T2100 Treadmill elevates to 12.5°.
- e. The GE T2100 Treadmill activates the walking belt. The walking belt goes from 0 to 21.7 km/h (13.5 mph) in increments of .8 km/h (0.5 mph) every 7.5 seconds.
- f. After reaching 21.7 km/h (13.5 mph) the walking belt coasts to a stop and the elevation lowers to 0°.
- g. The burn-in routine repeats until power is removed from the GE T2100 Treadmill.

Visual Inspection

A thorough visual inspection of the equipment can save time. Small things—disconnected cables, foreign debris on circuit boards, missing hardware, loose component—can frequently cause symptoms and equipment failures that may appear to be unrelated and difficult to track.

Take the time to make all of the recommended visual checks (refer to the visual inspection chart on the next page) before starting any detailed troubleshooting procedures.

CAUTION

Before performing any maintenance or repair on the equipment, take precautions against electrostatic discharge damage. See “Controlling Electrostatic Discharge” in Chapter 3.

CAUTION

Solder multilayer and surface mount PCB assemblies at your own risk! Improper repair methods can damage the PCB assemblies even further. Only qualified service personnel with the proper equipment should attempt to repair PCBs.

Power Down

Set the treadmill’s power switch to off (0). Disconnect the power cord from the AC wall outlet.

WARNING

Unplug the unit before performing the following procedure.

Table 17. Visual Inspection Chart

Area	Look for the following problems:
I/O Connectors and Cables	<ul style="list-style-type: none"> ■ Fraying or other damage ■ Bent prongs or pins ■ Cracked housing ■ Loose screws in plugs ■ Check that each terminal on the X1 connector is tightened securely. See “Drive Controller X1 PIN descriptions” on page 7-22 for torque requirements.

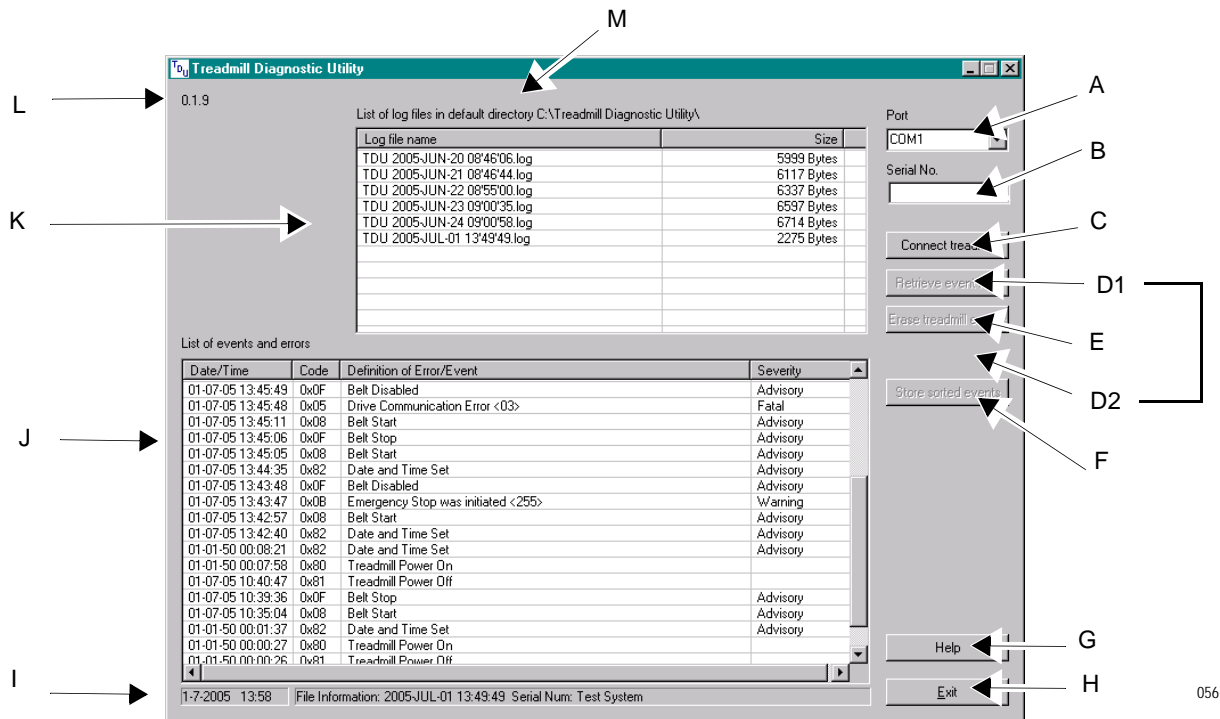
Table 17. Visual Inspection Chart

Fuses	<ul style="list-style-type: none"> ■ Type and rating. Replace as necessary. See "Power Board Fuse Locations" on page 6-29.
Interface Cables	<ul style="list-style-type: none"> ■ Excessive tension or wear ■ Check for loose connections ■ Check that each terminal on the X1 connector is tightened securely. See "Drive Controller X1 PIN descriptions" on page 7-22 for torque requirements ■ Strain reliefs out of place
Circuit Boards	<ul style="list-style-type: none"> ■ Moisture, dust, or debris (top and bottom) ■ Loose or missing components ■ Burn damage or smell of over-heated ■ Socketed components not firmly seated ■ PCB not seated properly in edge connectors ■ Solder problems: cracks, splashes on board, incomplete feed through, prior modifications or repairs
Ground Wires/Wiring	<ul style="list-style-type: none"> ■ Loose wires or ground strap connections ■ Faulty wiring ■ Wires pinched or in vulnerable position
Mounting Hardware	<ul style="list-style-type: none"> ■ Loose or missing screws or other hardware, especially fasteners used as connections to ground planes on PCBs
Power Source	<ul style="list-style-type: none"> ■ Faulty wiring, especially AC outlet. See "AC Line Voltage Test" on page 3-5 ■ Circuit not dedicated to system (Power source problems can cause static discharge, resetting problems, and noise)

GE T2100 Treadmill Diagnostic Utility (TDU)

The TDU can be installed on an FE laptop, PC, or a CASE system and is used as an interface to retrieve error and event logs stored in the GE T2100 Treadmill flash memory. These event and error logs are used to help troubleshoot problems, and identify historical trends. See “[TDU Troubleshooting Tables and Status LEDs](#)” on page 6-15 for diagnostic scenarios using TDU’s error and event codes.

Overview of the TDU Application Interface



Item	Description
A	<i>Port</i> – Serial communication port selection. (COM1 is the default port.)
B	<i>Serial No.</i> – Text field for manual input of the serial number which is only for documentation in the log file. (Instead of the serial number, an optional 16-digit text can be entered.)
C	<i>Connect treadmill</i> – A connection to the GE T2100 Treadmill will be established. This must be done before you can download a log file. The GE T2100 Treadmill characteristics (Type, Version, ...) are shown in the status line when the connection is done. For your PC/Laptop the connection will be released when the TDU is closed. The scratch file 'TDU Dwnld.txt' in default directory will be created or overwritten.

Item	Description
D1 / D2	<ul style="list-style-type: none"> ■ D1: <i>Retrieve event logs</i> – Initiates the download of the GE T2100 Treadmill event memory. After downloading the scratch file 'TDU Dwnld.txt' contains all rough data. Subsequently a text file will be created with an unique file name built of date and time and the extension '.log'. ■ D2: <i>Stop</i> – Only available while retrieving event logs. The process will stop and a log file will be created with the events that have been received.
E	<i>Erase treadmill events</i> – The GE T2100 Treadmill events will be erased in the device flash. All previous events stored are lost. The power up time, belt time, and elevation time are reset.
F	<i>Store sorted event</i> – Creates an additional log file with the events as sorted in the 'List of events and errors'. The sort criteria is documented in the log file. The filename remains with the addition 'sorted'.
G	<i>Help</i> – Shows this help file.
H	<i>Exit</i> – Exits the TDU. For your PC/Laptop the connection will be closed.
I	<i>Status line</i> – Displays current date and time, and status of the TDU utility.
J	<i>List of events and errors</i> – This list shows all events in a log file in a formatted form. By clicking the column header the list can be sorted accordingly. See " TDU Error Log Date and Time Information " on page 6-13 for a description of the TDU timestamp.
K	<i>List of log files in the default directory</i> – This list shows all log files in the default directory. You can double-click a log file to show its content in the 'List of events and errors'. All log files must have the file extension '.log'. Log file names can be modified by the user, e.g. for a better allocation, but the extension must be kept.
L	<i>Version</i> – Displays the currently operating version of the TDU.
M	Identifies the default directory where the log files are stored.

TDU Application Error Definitions

TDU Error	Error Definition
Default directory does not exist	The directory 'C:\Treadmill Diagnostic Utility' does not exist and could not be created. The directory needs to be created manually.
Log file is empty	The selected log file is empty. Open the log file with an ascii text editor such as notepad to verify.
Log file is inconsistent	The selected log file does not contain valid data or the log file has become corrupt. Open the log file with an ascii text editor such as notepad to view the log.
Open File Error	A text file could not be opened. If the TDU was connecting or starting to retrieve from the GE T2100 Treadmill, the scratch file 'TDU Dwnld.txt' could not be opened. If the TDU was viewing an event log or done retrieving from the GE T2100 Treadmill the log, the log file could not be opened. Verify the file exists in the default TDU directory.
Open COM Error	The selected COM port could not be opened. Verify a different application is not using the COM port. Restart the host system if the issue remains.
COM Error	Data can not be sent or received over the selected COM port. If the error continues to appear, restart the host system.
Treadmill not responding	The TDU is not receiving data from the GE T2100 Treadmill. Verify the GE T2100 Treadmill is powered on and connected to the correct COM port. If the error continues to appear, power cycle the GE T2100 Treadmill and restart the host system.
Download failed due to max. repetitions	The TDU received too many events with bad checksums over the serial cable. Verify the serial cable is fully inserted. If the error continues to appear, power cycle the GE T2100 Treadmill and restart the host system.
Download is inconsistent	The scratch file 'TDU Dwnld.txt' contains invalid data or the file has become corrupt. Open the file with an ascii text editor such as notepad to view the data. The event log may have to be retrieved again.

Download the TDU

The TDU application is available for download from GE service support portals. Follow the instructions below to access the nearest service portal.

NOTE

Customers can call Technical Support to receive the utility via email. See the “How to Reach Us” page in the front of the manual.

1. Create a directory folder *C:\Treadmill Diagnostic Utility* and download the *TDU.exe* and *TDU Help.pdf* into that directory. The TDU files can be downloaded from:
 - ◆ **Service Support Central Link** – http://supportcentral.ge.com/products/sup_products.asp?prod_id=20335
Software Library > Non-Invasive Cardiology > Resting/Stress
 - ◆ **EMEA Service Web Site** – <http://194.45.46.5/>
Software > Software Download > Cardiology > Stress Systems > T2100

Launch TDU and Retrieve Event and Error Logs

1. The TDU can be launched by running the *TDU.exe* file from the *C:\Treadmill Diagnostic Utility* directory, or right-click the *TDU.exe* and select *Send To > Desktop (create shortcut)* to create a shortcut.
 - ◆ For laptop/PC – Connect an RS232 DB9 cable (pn 700609-001) to the serial port on the FE laptop and the DB9 connector on the GE T2100 Treadmill, and launch TDU.
 - ◆ For CASE – Make sure the CASE is connected to the GE T2100 Treadmill using the standard RS232 DB9 interface cable (pn 700609-001), and launch TDU.
2. Select the COM Port that the GE T2100 Treadmill is connected to.

NOTE

TDU defaults to COM1, but can be changed to use any COM port in the *Port* drop-down list. Change the COM port assignments so TDU is configured with an available port.

3. Enter the GE T2100 Treadmill serial number, or other identifying text (up to 16 digits).
4. Click *Connect treadmill*.

Communication between the TDU and the GE T2100 Treadmill is established.

5. Click *Retrieve event logs*.

The latest log file is loaded into the *List of log files* panel. (Also, all existing log files in the *C:\Treadmill Diagnostic Utility* are displayed.)

- Double-click the log file name (in the top panel) and view the list of events and errors (in the bottom panel).

TDU Error Log Date and Time Information

Date/Time	Code	Definition of Error/Event
01-07-05 13:45:49	0x0F	Belt Disabled
01-07-05 13:45:48	0x05	Drive Communication Error <03>
01-07-05 13:45:11	0x08	Belt Start
01-07-05 13:45:06	0x0F	Belt Stop
01-07-05 13:45:05	0x08	Belt Start
01-07-05 13:44:35	0x82	Date and Time Set
01-07-05 13:43:48	0x0F	Belt Disabled
01-07-05 13:43:47	0x0B	Emergency Stop was initiated <255>
01-07-05 13:42:57	0x08	Belt Start
01-07-05 13:42:40	0x82	Date and Time Set
01-01-50 00:08:21	0x82	Date and Time Set
01-01-50 00:07:58	0x80	Treadmill Power On
01-07-05 10:40:47	0x81	Treadmill Power Off
01-07-05 10:39:36	0x0F	Belt Stop
01-07-05 10:35:04	0x08	Belt Start
01-01-50 00:01:37	0x82	Date and Time Set
01-01-50 00:00:27	0x80	Treadmill Power On
01-01-50 00:00:26	0x81	Treadmill Power Off

1-7-2005 13:58 File Information: 2005-JUL-01 13:49:49 Serial M

056

When the GE T2100 Treadmill is manufactured, or whenever the event log (flash memory) is erased, the system date and time (SDT) is set to January 1, 2050, 0:00:00 and is then stored into the flash memory. When power is applied to the GE T2100 Treadmill, the SDT is set to the saved SDT in the flash memory. While power is applied, the system updates the SDT every second. When the power is lost, the updated SDT is saved back to the flash memory. Therefore, the SDT is also the total power-up date and time, which is always relative to the initial date and time of January 1, 2050, 0:00:00.

The SDT is used when logging events in two different modes, the Default Mode and the Host Synchronized Mode.

Default Mode

When the GE T2100 Treadmill power switch is turned on, the GE T2100 Treadmill will always initialize in the Default Mode. When an event is logged while the system is in this mode, the event will be date and time stamped with the total power-up date and time.

Host Synchronized Mode

When the GE T2100 Treadmill receives a valid date and time from a host device, such as CASE v6 or the TDU, the GE T2100 Treadmill will enter the Host Synchronized Mode. The GE T2100 Treadmill will stay in this mode until power is lost to the GE T2100 Treadmill. While in this mode, the system keeps track of the number of seconds that pass since the date and time were received from the host. When an event is logged while the system is in this mode, the event will be date and time stamped with a date and time relative to what was sent by the host.

NOTE

When the GE T2100 Treadmill enters the Host Synchronized Mode, the "Date and Time Set" event is stored with a date and time relative to the power-up date and time. This event can be used to see how the following events with actual dates and times chronologically fit in regards to the power-up date and time. In addition, the date and time of the events can be used to match up with specific stress tests.

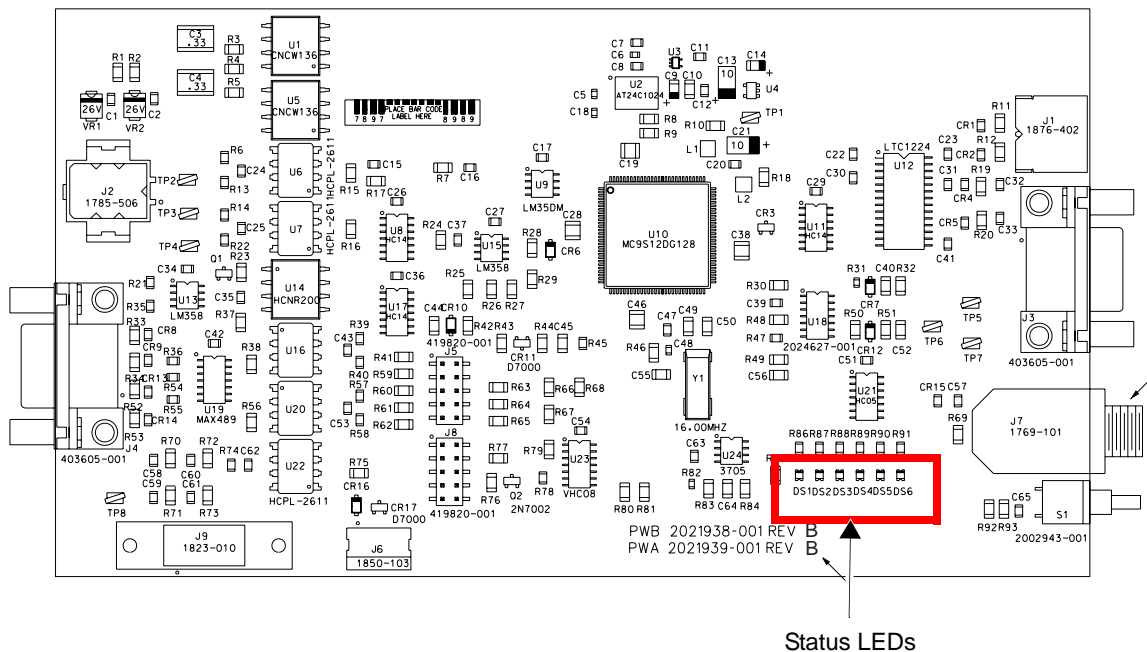
TDU Troubleshooting Tables and Status LEDs

See the tables below to aid in troubleshooting problems identified by the status LEDs, or reported in the TDU event and error codes.

Processor Board Status LEDs

Remove the shroud and e-box cover to view the processor board status LEDs.

- When power is applied to the e-box, the LEDs will turn on very quickly in sequence, starting at DS6 and going to DS1.
- If self-calibration has never been performed, the LEDs will stay on until the self-calibration routine is performed.
- If self-calibration has been performed, the LEDs will all turn off and then behave as described in the table below.
- When power is removed from the e-box, all LEDs will turn on until the system has completed the shutdown routines.



LED Status	Name	Description
DS1	Elevation / Calibration	This LED toggles on or off every 500ms if an elevation error has occurred. When the elevation error is cleared, the LED is off. During calibration this LED will turn on, and when a limit switch is reached the LED will flash rapidly for 100ms.
DS2	Drive / Burn-In	This LED toggles on or off every 500ms if a drive error has occurred. When the drive error is cleared, the LED is off. Also, the LED will turn on when burn-in is activated. During the burn-in cycle, the LED will flash rapidly for 100ms every time the belt speed increases.
DS3	Temperature	This LED toggles on or off every 500ms if a temperature warning occurs. The LED turns on and stays on if a temperature error occurs. The LED will be off when the internal temperature is within the normal operating limits.
DS4	Communication	This LED toggles on or off every 200ms while the microcontroller is receiving commands over the serial cable. If a command is not received after 500ms, the LED turns off. If a communication timeout occurs (no communication after 4 seconds anytime the belt is enabled), the LED turns on and stays on until a command is received.
DS5	Emergency Stop	This LED toggles on and off every 500ms while the system is monitoring the emergency stop line. When the emergency stop button is pressed or the ESTOP command is received, the LED turns on and stays on until 20 seconds after the emergency stop button is released.
DS6	Heartbeat	This LED toggles on or off every second when power is applied to the e-box. If power is applied and there is no heartbeat: 1. Verify the ESTOP switch is correctly installed 2. Check the fuses 3. Check the power test points for +24v and +5v If all the items above are working correctly, the problem is not in the e-box.

TDU Troubleshooting Table

Determine the error codes being reported by TDU and use the table below to help troubleshoot the cause, and identify the repair. Some TDU event / error codes also have detail descriptions breaking out specific causes within the event / error code.

TDU Event / Error Code	Status	Definition and Detail Description	Check These Items
0x00	Fatal (Halts Current Operation)	Memory Error: Indicates the flash memory was busy when the microcontroller lost power	Check the validity of the event log. Download multiple copies of the event log and check for additional memory errors or corrupt data. Erase the event log if corrupt data is found, or additional memory errors occur.
0x02	Fatal (Halts Current Operation)	Belt Error	<p>Measures the drive motor RPM.</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Check for loose wiring and connections between the drive controller and the drive motor. 3. Check the terminal connections on the X1 connector on the drive controller. See "Drive Controller X1 PIN descriptions" on page 7-22. 4. Check the power board and processor board test points verify they are operating within the test range. See "Power Supply Voltage Checks and Fuses" on page 6-27. 5. Swap the drive controller with a known working one. (If the problem persists...) 6. Replace the processor board. See "PCBs and Power Supply Replacement" on page 7-28.

TDU Event / Error Code	Status	Definition and Detail Description	Check These Items
0x03	Fatal (Halts Current Operation)	<p>Elevation Error:</p> <ul style="list-style-type: none"> ■ <00> During calibration, the potentiometer feedback did not change while the elevation motor was running. ■ <01> During calibration, the limit switch was detected as set before and after the motor started, and the potentiometer feedback changed. ■ <02> During calibration, the potentiometer reached maximum or minimum and the limit switch was not reached. ■ <03> During calibration, the potentiometer feedback for the maximum and minimum limits were too close together. ■ <04> During calibration, a timeout occurred waiting for the limit switch to be reached. ■ <05> During normal operation, the potentiometer feedback did not change while the motor was running. 	<p>Checks the elevation racks and elevation system.</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Inspect the elevation racks for any obstruction/foreign objects lodged between the gear teeth. 3. Check the elevation racks for any apparent damage to the gear teeth, or bending of the racks. 4. Check the elevation drive shaft (between the elevation racks) for damage or bending. 5. Check for loose wiring and connections between the elevation motor and the e-box. 6. Check the power board and processor board test points verify they are operating within the test range. See "Power Supply Voltage Checks and Fuses" on page 6-27. 7. Check for damage to the elevator capacitor. 8. Replace the elevation potentiometer with a known working POT. (If the problem persists...) 9. Replace the elevation motor with a known working motor. (If the problem persists...) 10. Replace the processor board. See "PCBs and Power Supply Replacement" on page 7-28.
0x04	Fatal (Halts Current Operation)	<p>Over Temperature Error (*C) <XX></p> <p>(where XX equals the temperature in Celsius)</p>	<p>The ambient temperature inside the e-box has reached 65° C (149° F).</p> <ol style="list-style-type: none"> 1. Remove power from the GE T2100 Treadmill and allow to cool off. 2. Power up the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 3. Check the power board and processor board test points and verify they are operating within the test range. See "Power Supply Voltage Checks and Fuses" on page 6-27. 4. Verify appropriate operating environment, 10°C to 40°C (50°F to 104°F) 5. Replace the processor board. See "PCBs and Power Supply Replacement" on page 7-28.

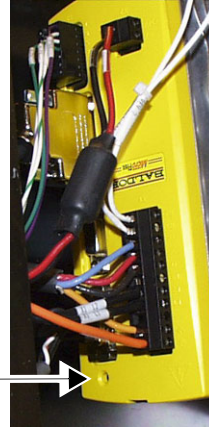
TDU Event / Error Code	Status	Definition and Detail Description	Check These Items
0x05	Fatal (Halts Current Operation)	Communication Error: <ul style="list-style-type: none"> ■ <01> Could not check for drive errors. ■ <02> Could not check for drive axis errors. ■ <03> Could not read the belt speed from the drive. ■ <11> Invalid error bit pattern while checking for drive errors. ■ <12> Invalid error bit pattern while checking for drive axis errors. ■ <13> Invalid speed detected while reading belt speed from drive. ■ <255> Command not received from host within 4 seconds while the belt was enabled. 	Communication error between the processor board and the drive controller, or the processor board and the host. 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Check for loose wiring and connections between the drive controller and the e-box. 3. Check for loose wiring and connections between the treadmill and the host. 4. Check the terminal connections on the X1 connector on the drive controller. See "Drive Controller X1 PIN descriptions" on page 7-22. 5. Check the power board and processor board test points and verify they are operating within the test range. See "Power Supply Voltage Checks and Fuses" on page 6-27. 6. Replace the drive controller with a known working drive controller. (If the problem persists...) 7. Replace the processor board. See "PCBs and Power Supply Replacement" on page 7-28.
0x06	Fatal (Halts Current Operation)	Over-voltage	Measures power into the GE T2100 Treadmill. 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Check the fuses. See "Power Board Fuse Locations" on page 6-29. 3. Check the power board and processor board test points and verify they are operating within the test range. See "Power Supply Voltage Checks and Fuses" on page 6-27. 4. Replace the power board. See "PCBs and Power Supply Replacement" on page 7-28.
0x07	Fatal (Halts Current Operation)	Under-voltage: <ul style="list-style-type: none"> ■ <00> Under-voltage detected while system still operating. ■ <255> Under-voltage caused system to shut down while the belt was enabled, or while the elevation motor was active. 	Measures power into the GE T2100 Treadmill. 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This error logs each time the treadmill is powered off. This may be an isolated incident.) 2. Check the fuses. See "Power Board Fuse Locations" on page 6-29. 3. Check the power board and processor board test points and verify they are operating within the test range. See "Power Supply Voltage Checks and Fuses" on page 6-27. 4. Monitor AC power into the GE T2100 Treadmill. Watch for inadequate power supply. 5. Replace the power board. See "PCBs and Power Supply Replacement" on page 7-28. (If the problem persists...) 6. Replace the processor board. See "PCBs and Power Supply Replacement" on page 7-28.
0x08	Warning	Belt Start	Not an error. Indicates the belt was started at this time.

TDU Event / Error Code	Status	Definition and Detail Description	Check These Items
0x09	Warning	Lower elevation limit reached: <ul style="list-style-type: none"> ■ <00> Not an error – occurred during calibration. ■ <01> Error – occurred during normal operation. 	Indicates that the elevation system extended beyond the low elevation limit. 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Initiate the self-calibration feature. 3. Check the elevation potentiometer. See "Elevation Potentiometer Replacement" on page 7-23. 4. Replace the elevation potentiometer.
0x0a	Warning	Upper elevation limit reached: <ul style="list-style-type: none"> ■ <00> Not an error – first occurrence during calibration. ■ <01> Not an error – second occurrence during calibration. ■ <02> Error – occurred during normal operation. 	Indicates that the elevation system extended beyond the upper elevation limit. 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Initiate the self-calibration feature. 3. Check the elevation potentiometer. See "Elevation Potentiometer Replacement" on page 7-23. 4. Replace the elevation potentiometer.
0x0b	Warning	Emergency stop was initiated: <ul style="list-style-type: none"> ■ <00> Stop command initiated from CASE. ■ <255> Stop command initiated from the ESTOP button. 	Emergency stop is engaged (or has been engaged). May be useful in determining if a "sudden stop" occurred because the emergency switch was engaged. 1. Disengage the emergency stop.
0x0c	Warning	Temperature Warning (*C) <XX> (where XX equals the temperature in Celsius)	The ambient temperature inside the e-box has reached 55° C (131° F). The GE T2100 Treadmill still operates correctly, but this warning indicates that something is causing the temperature to rise to near-fatal levels. (65° C is fatal.) 1. Remove power from the GE T2100 Treadmill and allow to cool off. 2. Power up the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 3. Check the power board and processor board test points and verify they are operating within the test range. See "Power Supply Voltage Checks and Fuses" on page 6-27. 4. Replace the power board and/or processor board if they are not operating within the test range.
0x0d	Advisory	Self Calibration	Not an error. Indicates self calibration was initiated.
0x0F	Advisory	Belt Stop	Not an error. Indicates the belt was stopped at this time.
0x80	—	Power On	The treadmill was powered on.
0x81	—	Power Off	The treadmill was powered off.
0x82	Advisory	Time Set	The date and time were set.
0x83	Advisory	Event Log Read	The event log was successfully read.
0xEE	Advisory	Event Log Erased	The event log was erased.

Drive Controller Status LED

The drive controller fault status LED is located underneath the X6 connector on the Drive Controller. Remove the shroud to view the LED.

Drive Controller Fault
Status LED



LED Status	Description
Solid Green	Drive enabled, normal operation.
Flashing Green	Firmware download in progress.
Solid Red	Drive is disabled, but no errors are latched.
Alternating Red/Green Flashing	Undervoltage warning (no AC power to the X1 connector), but no errors are latched.

LED Status	Description
LED is OFF	Check the 24 VDC control circuit supply is connected correctly to the X2 connector and is powered on.
Flashing Red	<p>Powerbase fault or error(s) present. The number of flashes indicates which error has occurred. For example, to display error 3 (overcurrent trip), the LED flashes 3 times at 0.1 second intervals, followed by a 0.5 second pause. The sequence is repeated continuously.</p> <p>If multiple errors occur at the same time, the lowest numbered error code will be flashed. For example, a MicroFlex which has tripped on both feedback error (code 5) and over-current error (code 3) will flash error code 3. If the drive is already displaying an error code when a new error with a lower code occurs, the drive will start flashing the new code. Note that undervoltage trip does not appear in the table because it is already indicated by the green/red flashing state. If an undervoltage trip occurs in conjunction with another error, the drive will flash the code of the additional error.</p> <p>See the troubleshooting table below for the event / error code and it's corresponding red flashing LED.</p>

TDU Troubleshooting Table for Drive Controller

Determine the error codes being reported by TDU and use the table below to help troubleshoot the cause and identify the repair.

TDU Event / Error Code	Number of Red LED Flashes	Definition	Check These Items
0x10	1	DC bus over-voltage trip	<p>Indicates the DC Bus voltage has exceeded the overvoltage level.</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Verify that the AC power supply voltage is correct. See "AC Line Voltage Test" on page 3-5. 3. Verify that the voltage check test points on the power and processor control boards are within the test range. See "Power Supply Voltage Checks and Fuses" on page 6-27. 4. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 5. Replace the drive controller.
0x11	2	IPM (Intelligent Power Module) trip	<p>The IPM has detected an internal overcurrent, short circuit, over temperature or under voltage fault.</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 3. Replace the drive controller.
0x12	3	Over-current trip	<p>Indicates Current has exceeded 300% of Drive Rated Current.</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Check the motor cables and drive controller connections for short circuits. 3. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 4. Replace the drive controller.
0x13	4	Over-speed trip	<p>Indicates that the measured speed of the motor has exceeded the trip level. (When accelerating to a demand speed close to the trip level, there will typically be a certain amount of overshoot that may cause this error.)</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 3. Replace the drive controller.

TDU Event / Error Code	Number of Red LED Flashes	Definition	Check These Items
0x14	5	Feedback trip	<p>Indicates loss of encoder/resolver feedback and may indicate that the feedback cable has become detached, one of the signals has broken, or noise is present.</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Check the wiring in the Feedback cable. 3. Check the cable screens. 4. Check for damage to the encoder, under the motor cap. 5. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 6. Replace the drive controller.
0x15	6	Motor overload (I2t) trip	<p>The motor overload current protection algorithms have exceeded their limit and disabled the drive. (The motor / drive can run with demand currents greater than their rated value for a period of time; after that time the drive will either trip or automatically foldback the demand current.)</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Confirm that the motor is not overloaded or stalling. 3. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 4. Replace the drive controller.
0x16	7	Over-temperature trip	<p>The ambient temperature of the drive controller has exceeded the trip level, or the Motor overtemperature trip input has been activated.</p> <ol style="list-style-type: none"> 1. Allow the unit to cool. 2. Increase ventilation and reduce ambient temperature. 3. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 4. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 5. Replace the drive controller.

TDU Event / Error Code	Number of Red LED Flashes	Definition	Check These Items
0x17	8	Drive overload (It) trip	<p>The drive overload current protection algorithms have exceeded their limit and disabled the drive. (The motor / drive can run with demand currents greater than their rated value for a period of time; after that time the drive will either trip or automatically foldback the demand current.)</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Confirm that the motor is not overloaded or stalling. 3. Verify connections to braking resistor are not damaged. 4. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 5. Replace the drive controller.
0x18	9	Following error trip	<p>Position or velocity following error. Following errors could be caused by a badly tuned drive controller/motor, especially at high acceleration and deceleration rates where the following error will typically be greater. Following error could also be the caused by encoder/resolver loss.</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Confirm that the motor is not overloaded or stalling. 3. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 4. Replace the drive controller.
0x19	10	Error input triggered	<p>Indicates a user-defined condition has been activated and generated an error.</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 3. Replace the drive controller.
0x1a	11	Phase search error	<p>The drive controller has a pre-charge circuit which must activate after power-up before the drive controller can be enabled. If the drive controller is enabled before this, then the error occurs. The error could also indicate the loss of one or more of the input phases.</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 3. Replace the drive controller.

TDU Event / Error Code	Number of Red LED Flashes	Definition	Check These Items
0x1b	12	Other error	<p>Other errors, including: Internal supply error. Encoder supply error. Parameter restore failure. Power base not recognized. Under voltage trip.</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 3. Replace the drive controller.
0x1c	N/A	Unknown error code	<p>Indicates an unknown condition has generated an error.</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 3. Replace the drive controller.
0x1d	Flashing Red and Green	DC Bus Undervoltage Trip	<p>Indicates the DC Bus voltage has fallen below the undervoltage level.</p> <ol style="list-style-type: none"> 1. Powercycle the GE T2100 Treadmill and monitor the GE T2100 Treadmill for reoccurrence of this error. (This may be an isolated incident.) 2. Verify that the AC power supply voltage is correct. See "AC Line Voltage Test" on page 3-5. 3. Verify that the voltage check test points on the power and processor control boards are within the test range. See "Power Supply Voltage Checks and Fuses" on page 6-27. 4. Determine if any TDU Troubleshooting Table errors are also being reported, and if so, follow the troubleshooting procedure for the reported errors. 5. Replace the drive controller.

Power Supply Voltage Checks and Fuses

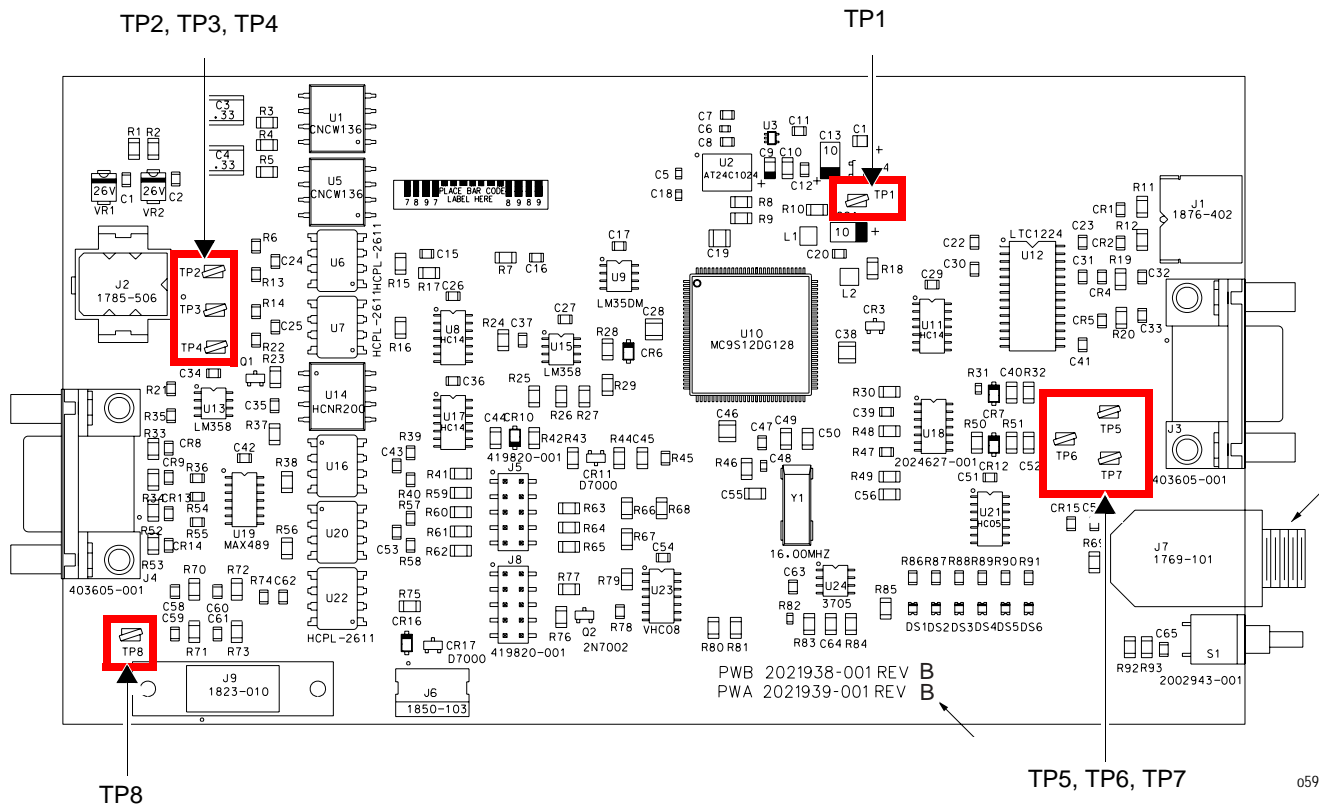
With the power on, remove the side panel on the electronics box to measure the system's supply voltages as stated below. Remove the shroud and e-box cover to view the LEDs and fuses.

Processor Board Voltage Checks

Signal Name	Nominal value	Test range	Test point	Reference
+5V_ISO	+5.1 VDC	+/- 5%	TP6	ISOGND TP7
+3.3V_ISO	+3.3 VDC	+/- 5%	TP1	ISOGND TP7
+VUNREG	+11.5 VDC	+/- 5%	TP5	ISOGND TP7
+5.1V	+5.1 VDC	+/- 5%	TP8	DGND TP4
+24V	+24 VDC	+/- 5%	TP2	GND_24V TP3

Also verify that U15, pin 8, has 8.2 VDC (+/- 5%)

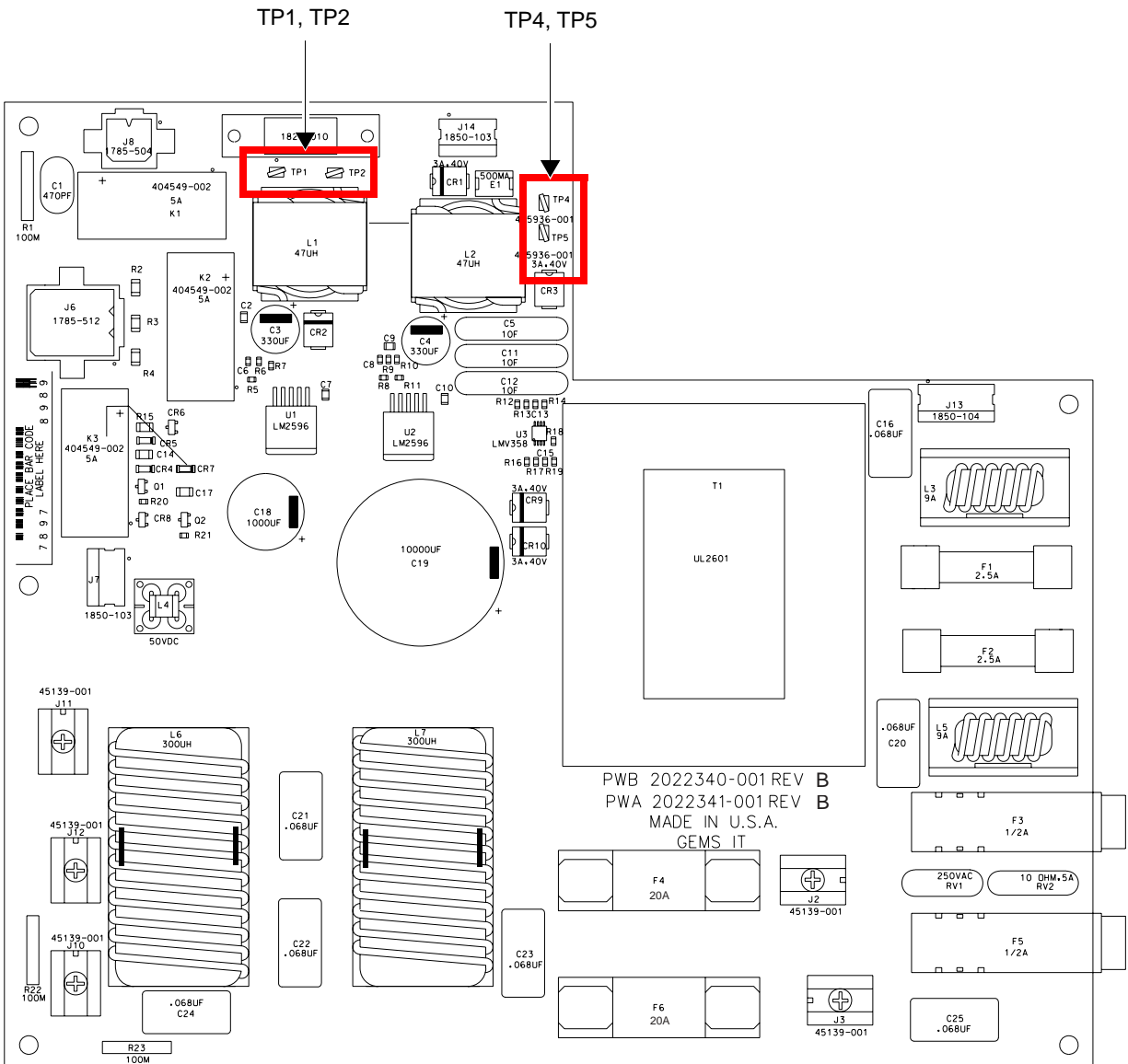
Processor Board Voltage Check Test Points



Power Board Voltage Checks

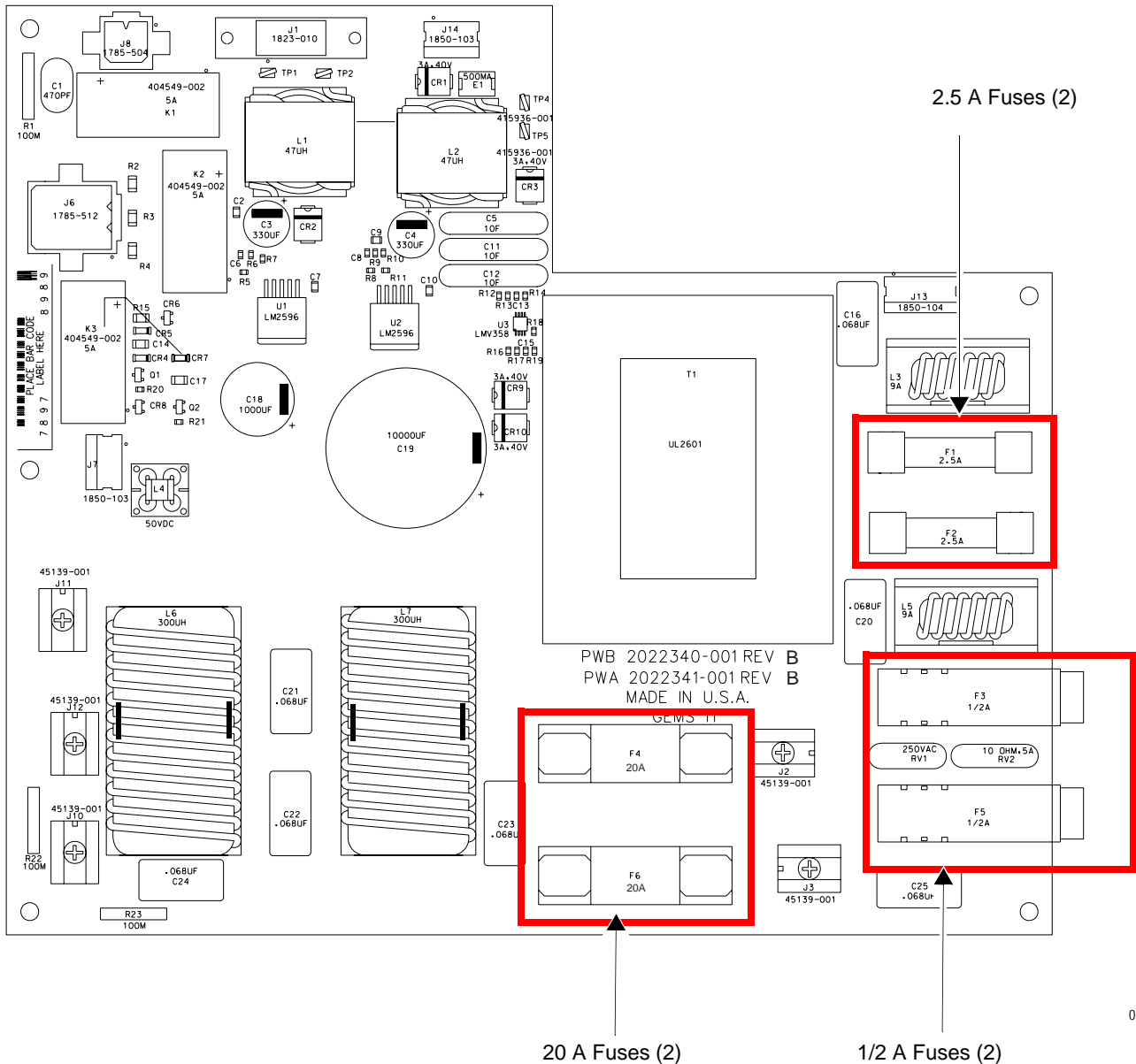
Power Type	Signal Name	Nominal value	Test range	Test point	Reference
ISO Power	+5V_ISO	5.1V	+/- 5%	TP5	ISOGND TP4
Non-Isolated Power	DGND	5.1V	+/- 5%	TP1	DGND TP2

Power Board Voltage Check Test Points



Power Board Fuse Locations

The 20A and 2.5A fuses are located on the power board. Remove the cover of the e-box to access and change these fuses. The 1/2A fuses are accessed at the connector panel on the back of the GE T2100 Treadmill.



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For your notes

7 Assembly/Disassembly

For your notes

Assembly and Disassembly Procedures

Required Tools and Supplies

To maintain and repair the GE T2100 Treadmill, you will need the following:

- Standard hand tools, including:
 - ◆ Socket and Driver set – 9mm (3/8”) or 12mm (1/2”) drive, including extensions and 9mm (3/8”), 11mm (7/16”), 12mm (1/2”), 14mm (9/16”) sockets
 - ◆ Wrench set – with opposite "box" and "open" ends in 9mm (3/8”), 11mm (7/16”), 12mm (1/2”), 14mm (9/16”)
 - ◆ Screwdrivers – small and medium size "flat" tip and "Phillips" tip
 - ◆ Needlenose pliers
 - ◆ Crescent Wrench/Channel Locks – 40mm (1 1/2”) minimum
 - ◆ Hex Key set – 3mm (1/8”), 4mm (5/32”), 6mm (1/4”)
 - ◆ Carpenter's level
- DVOM
- Leakage current tester PN MT-1216-01 (for 120 V), PN MT-1216-02 (for 240 V), or equivalent
- CASE Treadmill Interface cable PN 700609-001C
- Antiseptic cleaner
- Dust remover (compressed air)

Leakage Tests

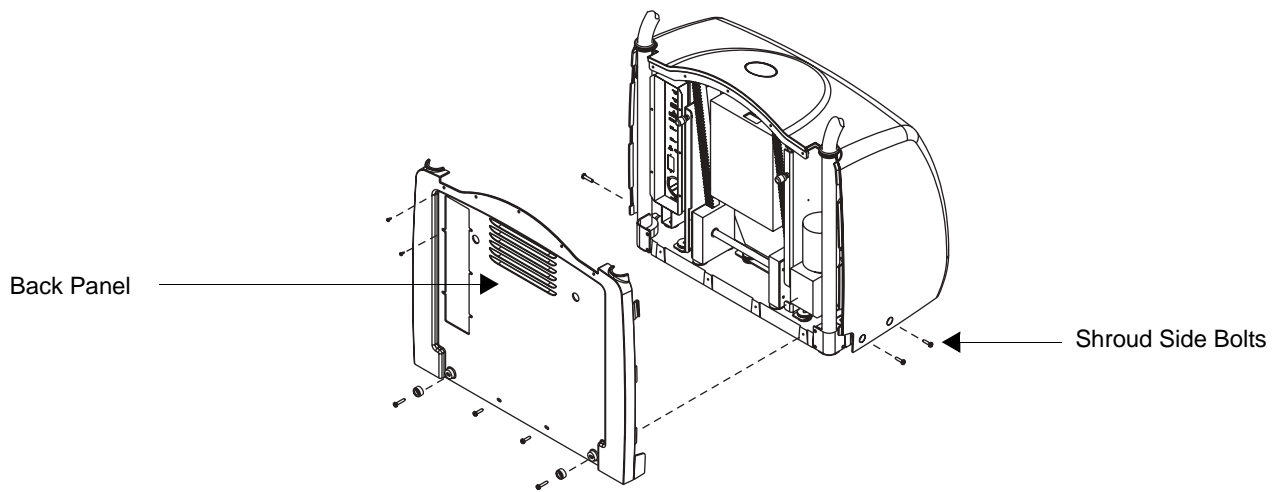
GE Medical Systems *Information Technologies* recommends that you perform the electrical leakage tests whenever internal assemblies are serviced.

See “[Leakage Tests](#)” on page 3-12.

Shroud Removal

To remove the GE T2100 Treadmill shroud for the internal visual inspection or for service:

- ◆ Disconnect the power cord from the rear connector panel.
- ◆ Remove the screws on the shroud back and remove the back panel.
- ◆ Remove the 2 bolts on each side of the shroud.
- ◆ Lift off the shroud.

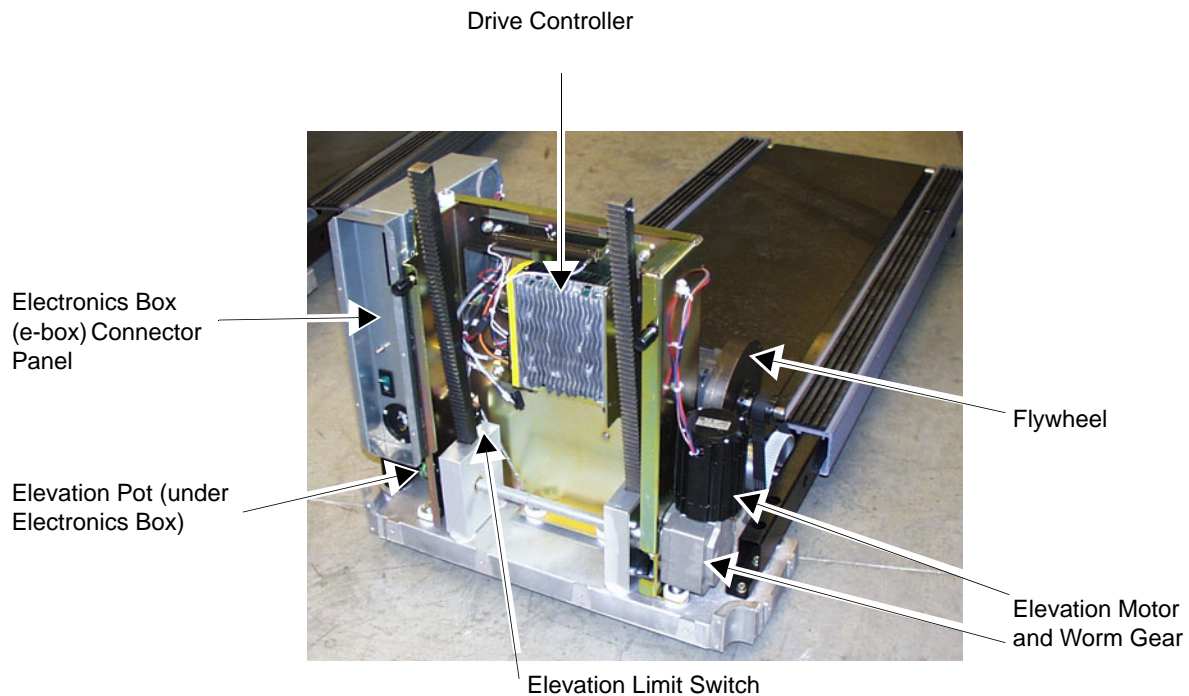


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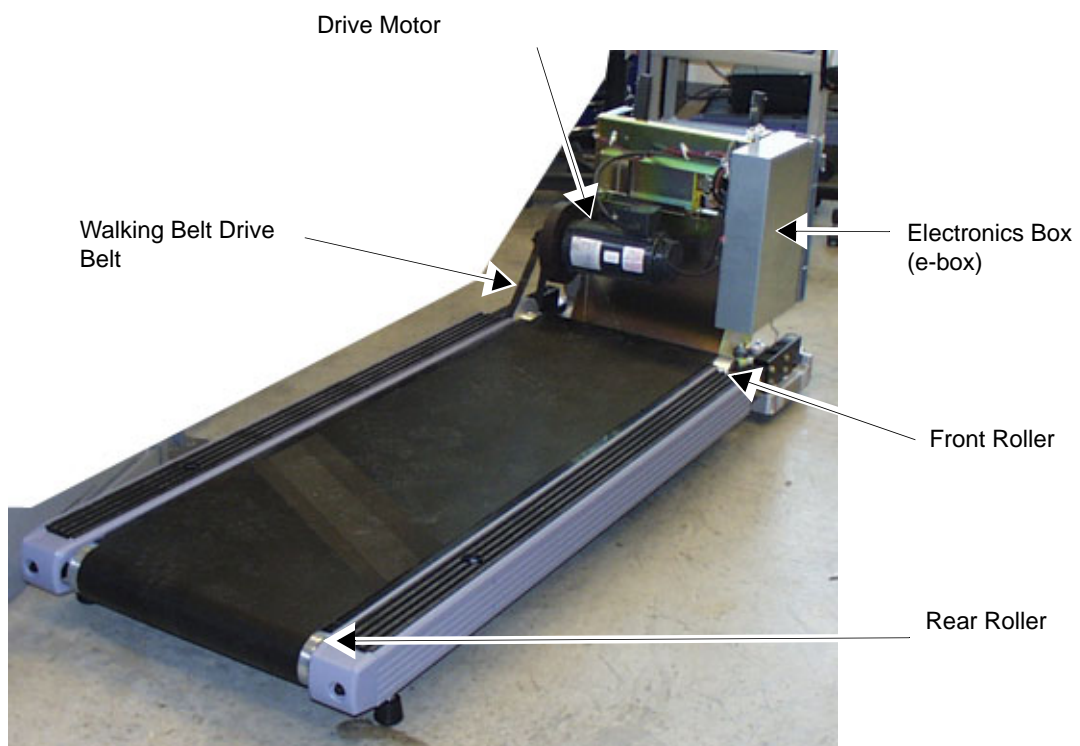
Location of Major Sub-Assemblies

WARNING

Electrical shock hazard between chassis ground and isolated ("floating") ground when power is applied. Unplug the unit from the power source before proceeding.



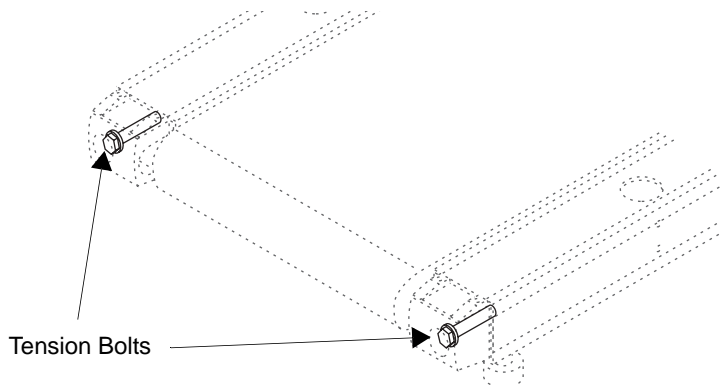
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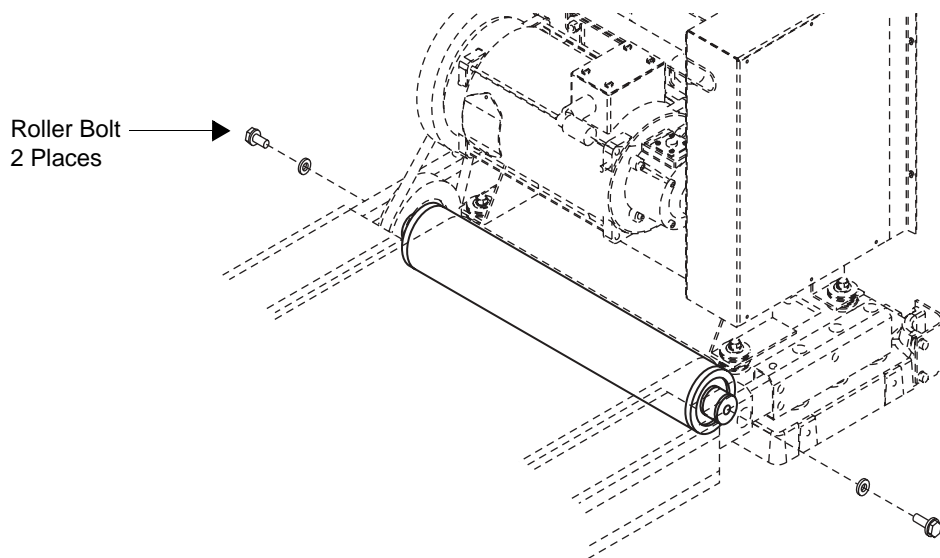
Front Roller Replacement

1. Turn the power switch off, disconnect the power cord from the wall outlet, and remove the shroud.
2. Loosen the drive belt and remove it from the sprocket. See “[Drive Motor Replacement](#)” on page 7-12 for steps relative to loosening the drive belt.
3. Loosen the walking belt tension bolts on the end of the GE T2100 Treadmill.



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4. On the drive-belt side of the GE T2100 Treadmill, remove the 3 bolts fastening the walking belt drive gear to the roller.
5. Locate the roller bolt access hole. Remove the 9/16-inch bolt (one of two that holds the roller in position).



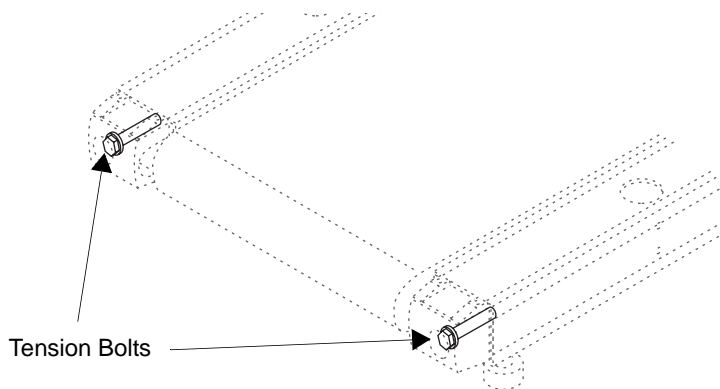
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6. While supporting the free end of the roller, remove the 9/16-inch bolt on the opposite side of the GE T2100 Treadmill.
7. Remove the drive belt gear.
8. Lift the roller up and slide it out of the belt.

9. Install the new roller in reverse order, and then adjust the drive belt tension and tracking. See “[Drive Belt Adjustments](#)” on page 7-16 and “[Adjust Drive Belt Tracking](#)” on page 7-17.
10. Adjust walking belt tracking and tension. See “[Walking Belt Tension Adjustment](#)” on page 4-5.
11. Calibrate the GE T2100 Treadmill. See “[Self-Calibration](#)” on page 3-10.”

Rear Roller Replacement

1. Turn the power switch off and disconnect the power cord from the wall outlet.
2. Remove the walking belt tension bolts on the end of the GE T2100 Treadmill and remove the end caps.



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3. Locate the roller bolt access holes and remove the 9/16-inch bolt from one side.
4. While supporting the free end of the roller, remove the 9/16-inch bolt on the opposite side of the GE T2100 Treadmill.
5. Lift the roller up and slide it out of the belt.
6. Install the new roller in reverse order, and then adjust the walking belt tracking and tension. See [“Walking Belt Tension Adjustment”](#) on page 4-5.
7. Calibrate the GE T2100 Treadmill. See [“Self-Calibration”](#) on page 3-10.”

Walking Belt and Board Replacement

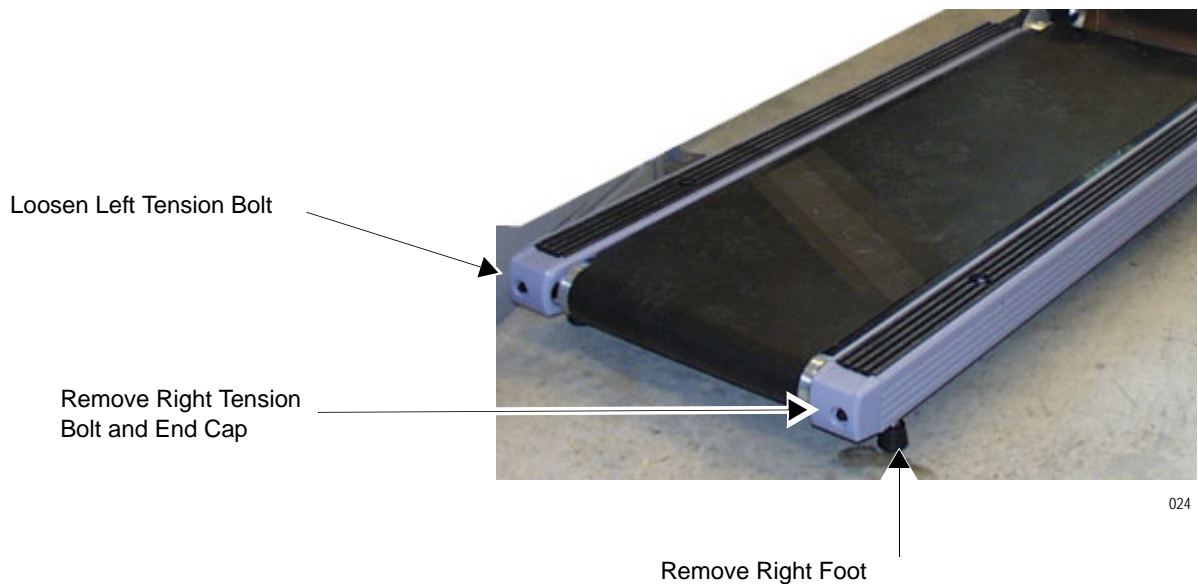
Walking Belt Replacement Instructions

1. Turn the power switch off, disconnect the power cord from the wall outlet, and remove the shroud.

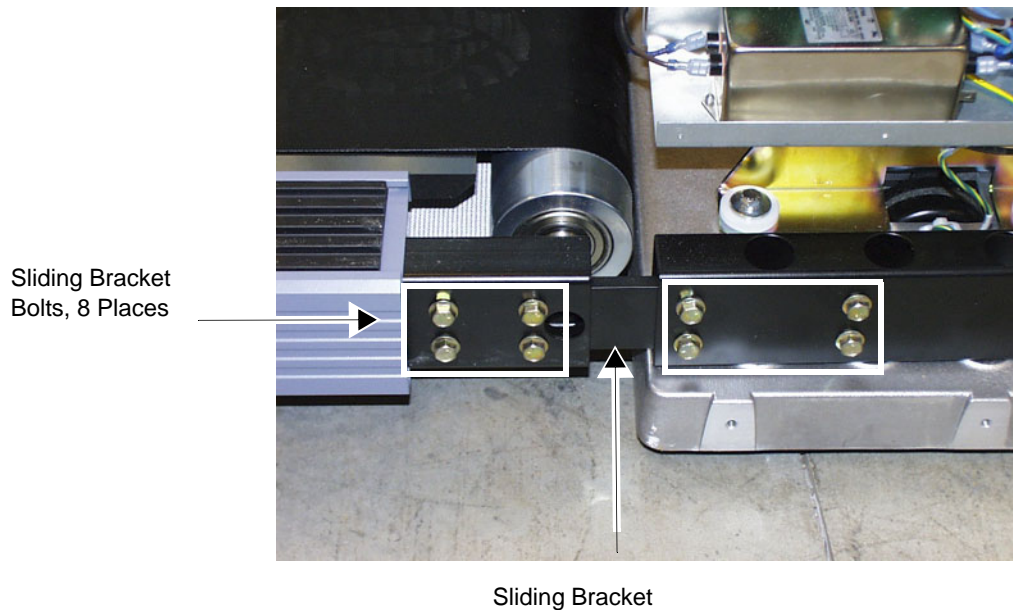
NOTE

You do not have to remove either roller to replace the belt.

2. Loosen the tension bolt on the left end cap.
3. Remove the tension bolt and the right end cap.
4. Loosen the keeper nut on the right foot, and unscrew and remove the right foot.



5. On the front right side of the GE T2100 Treadmill, remove the eight, 1/2-inch bolts that hold the frame's sliding bracket in place.



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6. Slide the bracket left, into the frame.

NOTE

Don't worry if the bracket slides in too far. During re-assembly you can lift the back end of the GE T2100 Treadmill and the bracket will slide back where you can reach it.

7. Slide the belt between the rear and front roller, removing the belt from the rear roller first.
8. Replace the walking board before re-installing a new walking belt. See ["Walking Board Replacement Instructions"](#) on page 7-10.

NOTE

The wax material on the walking board acts as a lubricant for the belt. We recommend that you replace the walking board every time you put on a new walking belt to ensure the belt absorbs the required amount of lubricant.

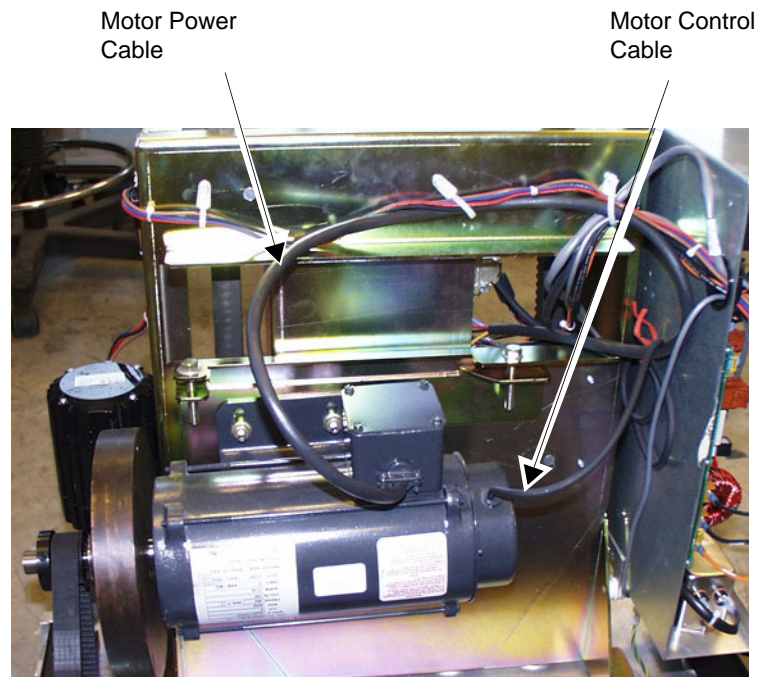
Walking Board Replacement Instructions

1. Remove the walking belt as instructed in the previous steps.
2. Remove the eight, 5/32-inch Allen-head, counter-sunk screws from the top of the walking board. (The fastening nuts on the underside of the GE T2100 Treadmill are welded in place.)
3. Lift the walking board off the GE T2100 Treadmill.

4. Place the new walking board on the GE T2100 Treadmill with the beveled edges facing down, towards the rollers.
5. Secure the new walking board to the bed assembly with the 8 Allen-head screws.
6. Replace the walking belt. Use the reverse order used to remove the walking belt as described in [“Walking Belt Replacement Instructions”](#) on page 7-9.
7. Adjust the walking belt tracking and tension. See [“Walking Belt Tension Adjustment”](#) on page 4-5.
8. Calibrate the GE T2100 Treadmill. See [“Self-Calibration”](#) on page 3-10.”

Drive Motor Replacement

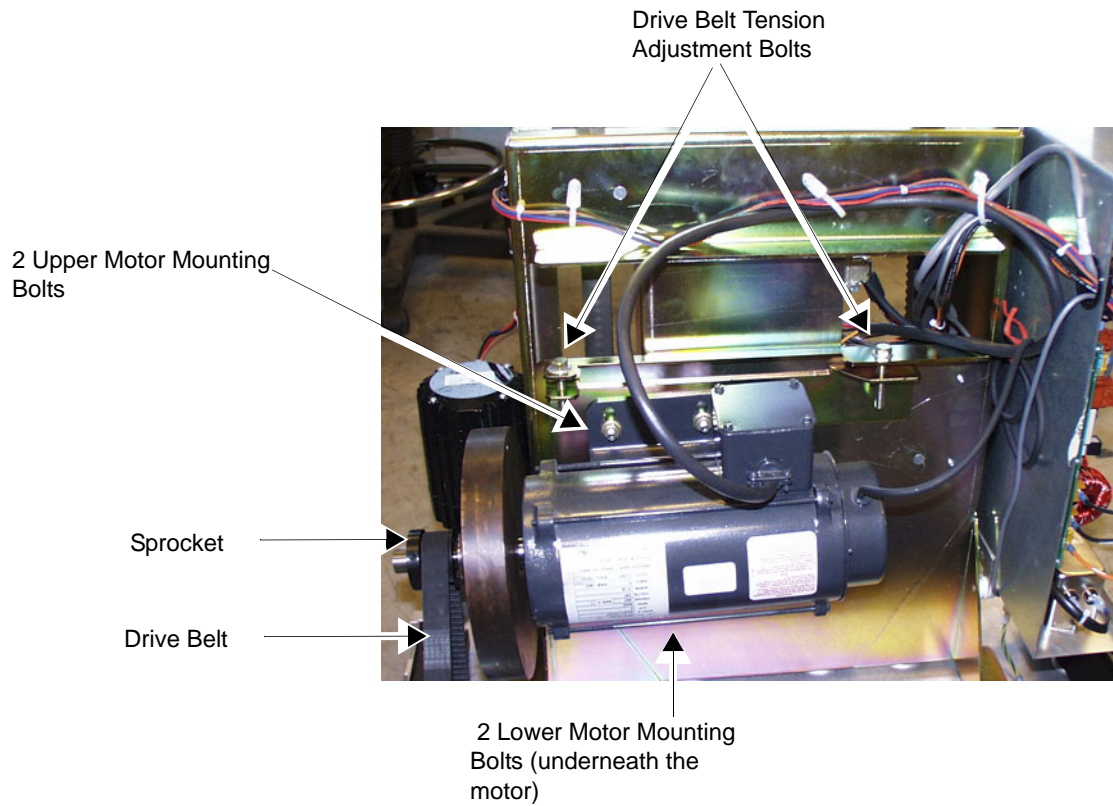
1. Turn the power switch off, disconnect the power cord from the wall outlet, and remove the shroud.
2. Unplug the motor control cable from the drive controller.
3. Unplug the motor power cable from the drive controller.
4. Unscrew the wires from the X1 connector that lead to the motor. See [“Drive Controller X1 PIN descriptions”](#) on page 7-22.
5. Cut any plastic retaining straps.



033

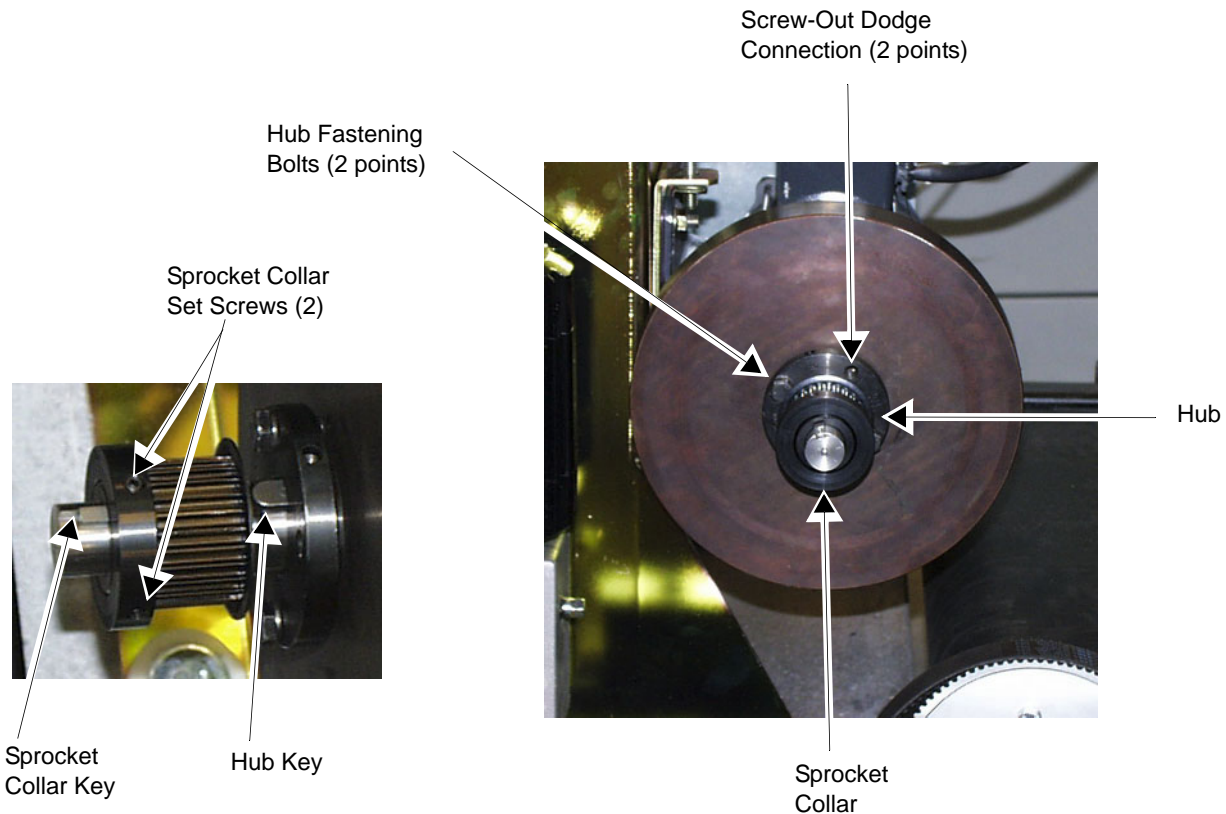
6. Loosen the 4 motor mounting bolts, but DO NOT remove them.

7. Lower the motor using the 2 drive belt tension adjustment bolts until the drive belt can be removed from the sprocket.



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8. Remove the 2 set screws from the sprocket collar, and remove the collar.



9. Remove the sprocket key and remove the sprocket.
10. Remove the hub fastening bolts and using your fingers screw the bolts into the screw-out dodge connection points until they make contact with the flywheel.
11. Alternate between each bolt, slowly turning each bolt approximately 1/16th turn until the hub can be removed.

NOTE

The hub is machined to a tight tolerance with the motor shaft.
DO NOT attempt to force the hub by turning the bolts too far at one time.

12. Remove the hub when it is loose of the motor shaft.
13. Remove the hub key and the flywheel.

NOTE

The flywheel weighs 15 lbs. (6.8 k)

14. Remove the 4 motor mounting bolts and carefully remove the motor.

NOTE

The drive motor weighs 33 lbs. (15 k)

15. Swap motors and re-assemble in reverse order following the note below when installing the hub and flywheel.

NOTE

The flywheel is balanced and if installed 180° off will cause vibration when in operation. Match up the mark on the flywheel with the mark on the hub for the proper position of installation.

16. When the new drive motor is installed, adjust the drive belt tension and tracking. See “[Drive Belt Adjustments](#)” on page 7-16 and “[Adjust Drive Belt Tracking](#)” on page 7-17.
17. Calibrate the GE T2100 Treadmill. See “[Self-Calibration](#)” on page 3-10.”

Drive Belt Replacement and Adjustments

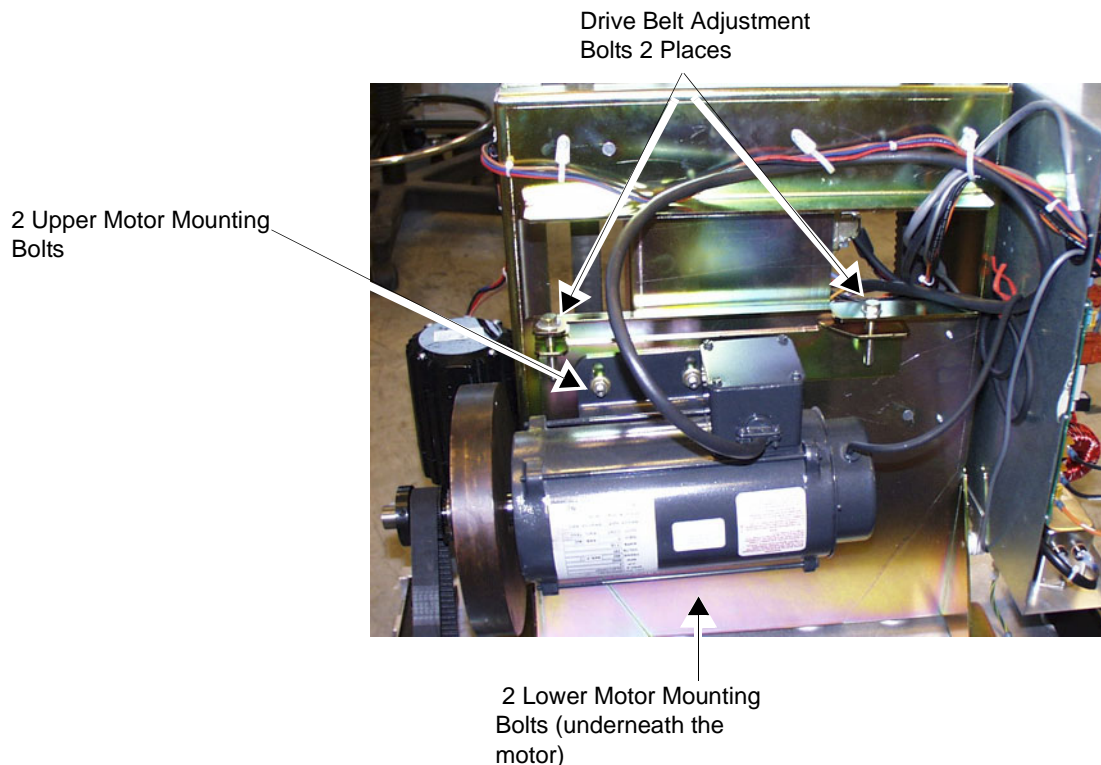
Replace the Drive Belt

1. Turn the power switch off, disconnect the power cord from the wall outlet, and remove the shroud.
2. Remove the front roller as described in “[Front Roller Replacement](#)” on page 7-6.
3. Loosen the 4 motor mounting bolts and use the 2 drive belt adjustment bolts to lower the motor and loosen the drive belt tension.
4. Remove the old belt and replace with a new belt.
5. Replace the front roller and adjust the drive belt tension. See “[Adjust Drive Belt Tension](#)” on page 7-16.

Drive Belt Adjustments

Adjust Drive Belt Tension

1. There are two drive belt tension adjustment bolts above the DC motor. Tighten these 1/2-inch bolts to adjust the drive belt tension (clockwise to tighten).



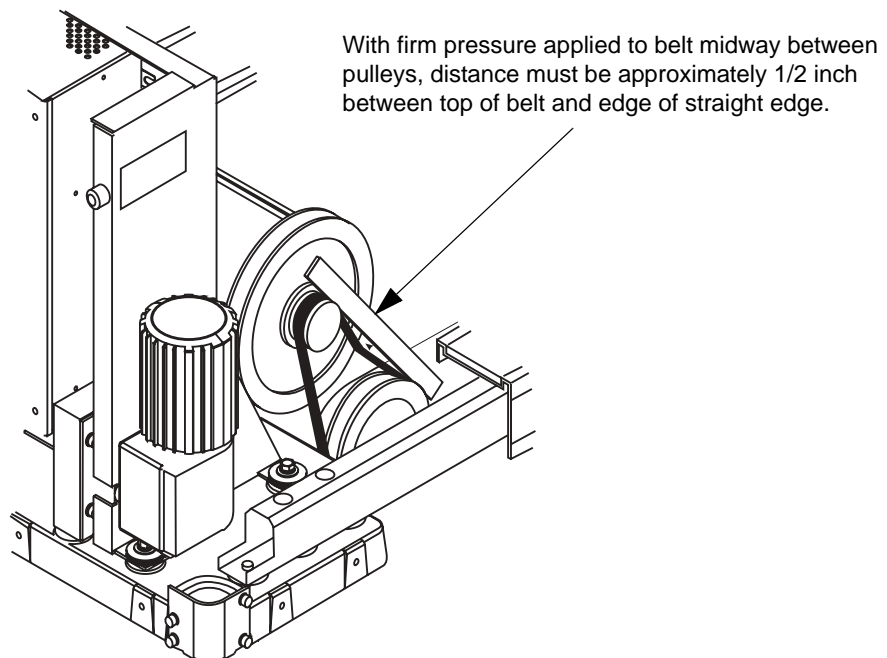
033

2. Fine tune the belt tension with the adjustment bolts so that you can push the belt in approximately 1/2-inch on one side.

CAUTION

Excessive tension on the drive belt is not necessary and will cause undue stress on the motor shaft with the possibility of damaging the motor.

Use the illustration below as a guideline to properly adjust the tension of the drive belt.



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3. Tighten the 4 motor mounting bolts when the drive belt tension is correct and adjust the drive belt tracking. See [“Adjust Drive Belt Tracking”](#) on page 7-17.

Adjust Drive Belt Tracking

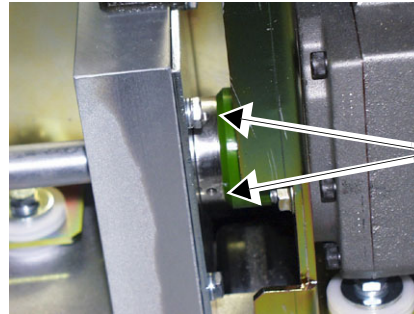
The motor should be mounted at a slight angle so the belt meshes quietly with the sprockets. The side with the drive belt should be slightly lower than the other side. See the photo in [“Adjust Drive Belt Tension”](#) on page 7-16. Notice the drive belt adjustment bolts, and how the left adjustment is slightly lower than the right adjustment.

Because of this design, the drive belt will always track to the left side of the top sprocket (and this is normal) but should track down the middle of the lower sprocket. If the drive belt tracks off center on the lower sprocket, adjust the position of the top sprocket until the drive belt tracks in the center of the lower sprocket. When the drive belt is tracking

correctly, calibrate the GE T2100 Treadmill. See “Self-Calibration” on page 3-10.”

Elevation Motor Replacement

1. Use the controlling equipment to elevate the GE T2100 Treadmill approximately 6 inches (15 cm), and until the set screws on the elevation shaft collar are accessible.



Elevation Shaft
Collar Set Screws
(2)

054

NOTE

It is important to raise the GE T2100 Treadmill to give access to an elevation motor mounting bolt later in this procedure.

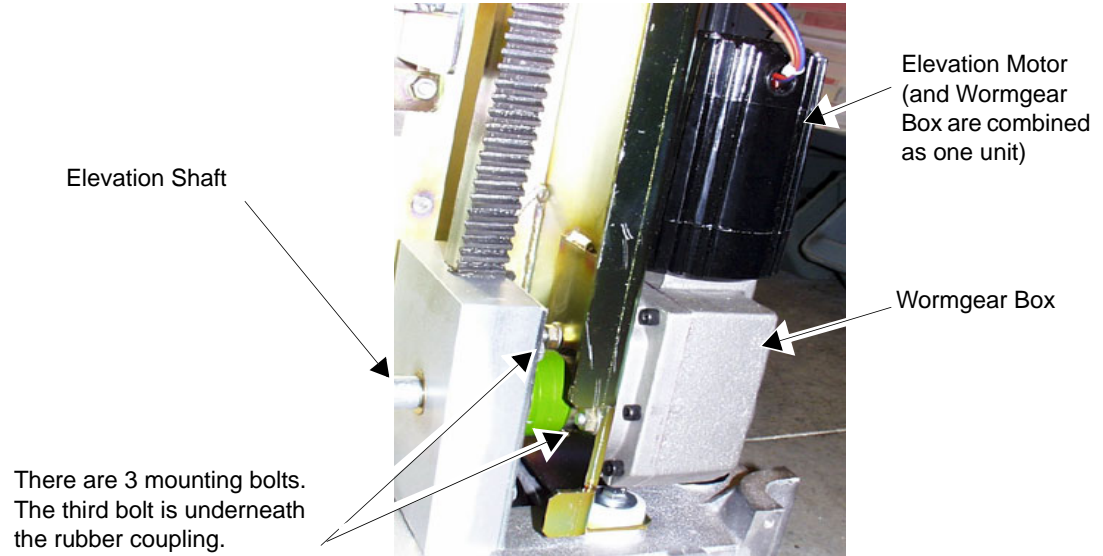
2. Turn the power switch off, disconnect the power cord from the wall outlet, and remove the shroud.
3. Remove the elevation shaft collar set screws.
4. Remove the elevation potentiometer (under the electronics box). See [“Potentiometer Removal Guidelines”](#) on page 7-25.
5. Disconnect the elevation motor power cable plug and jumpers at the electronics box and remove all tie wraps on the cable.
6. Place the GE T2100 Treadmill on its side so the elevation motor is on top.

WARNING

The elevation motor wormgear supports the elevation shaft when the motor is in place. After removing the motor, the elevation shaft becomes “free,” allowing the GE T2100 Treadmill to free-fall to the ground.

To prevent the GE T2100 Treadmill from falling, only replace the elevation motor with the GE T2100 Treadmill on its side.

7. Remove the two visible mounting bolts on the elevation motor.



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8. Remove the third mounting bolt underneath the rubber coupling.

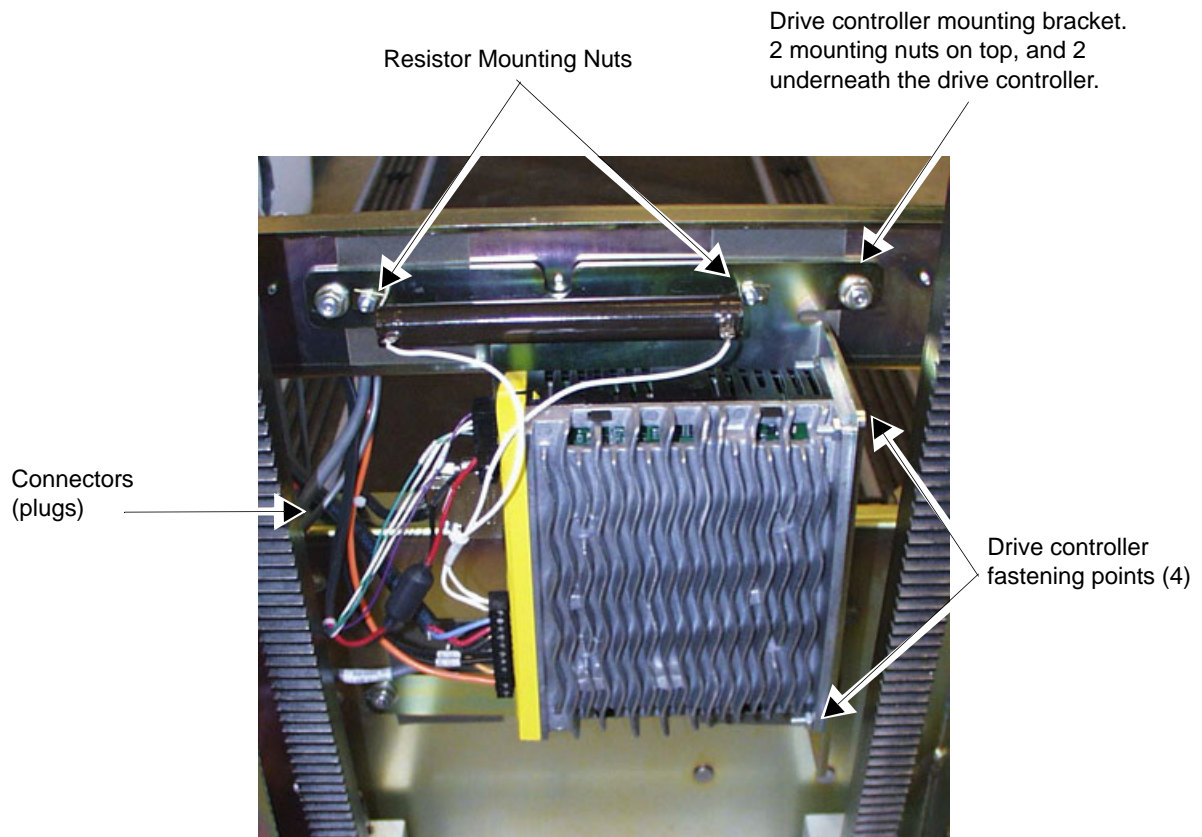
NOTE

If the third mounting bolt is difficult to remove, you may have to remove the wheel to provide adequate access to the third mounting bolt.

9. Remove the elevation motor from its coupling.
10. Replace with a new motor in reverse order. Follow these guidelines.
 - a. Use a dab of lithium grease to hold the key in the motor shaft keyway, line up the keyway with the coupling's key slot, and slowly turn the elevation shaft until the two mate.
 - b. See "[Potentiometer Installation Procedure](#):" on page 7-23 for procedures when installing the potentiometer.
11. Replace the tie wraps for the elevation motor wiring harness.
12. Calibrate the GE T2100 Treadmill. See "[Self-Calibration](#)" on page 3-10."

Drive Controller Replacement

1. Turn the power switch off, disconnect the power cord from the wall outlet, and remove the shroud.
2. Remove the 2 resistor mounting nuts.
3. Disconnect all connectors from the drive controller.
4. Remove the 4 nuts from the drive controller mounting bracket and remove the mounting bracket and drive controller from the GE T2100 Treadmill.
5. Remove the 4 nuts from the drive controller fastening points.
6. Remove the drive controller and replace with a new drive controller in reverse order.



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7. Calibrate the GE T2100 Treadmill. See **“Self-Calibration”** on page 3-10.”

Drive Controller X1 PIN descriptions

Follow this diagram when wiring the X1 connection. Tighten each terminal to a torque of 0.5–0.6Nm (4.4–5.3 lb-in).



R2
R1
W
V
U
L3 – NC
L2
L1
NC
Gnd
Gnd

061

PIN	Description
R2 & R1	White wires going to the resistor. These wires can be inverted.
W	Blue wire going to the drive motor.
V	Red wire going to the drive motor.
U	Black wire going to the drive motor.
L3	Not used.
L2	Black wire going to the L2 terminal on the power board.
L1	Black wire going to the L1 terminal on the power board.
NC	Not used.
Gnd	Orange-Yellow wire earth/ground going to the motor. Can be inverted with the other Gnd.
Gnd	Orange wire earth/ground going to the ground terminal on the power board. Can be inverted with the other Gnd.

Elevation Potentiometer Replacement

General

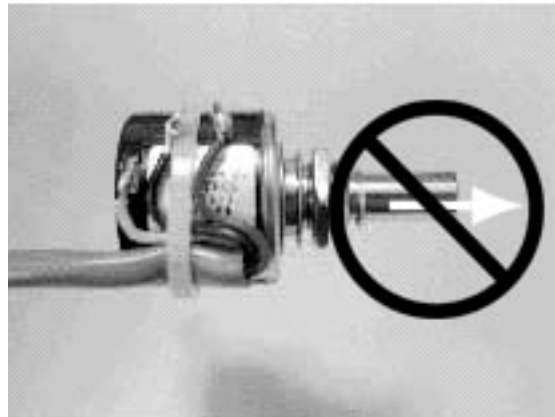
Replace the Elevation Potentiometer Harness on GE T2100 Treadmills experiencing elevation hesitation and seeking problems or a faulty GE T2100 Treadmill stop condition during an elevation change.

Elevation Potentiometer Harness Assembly Replacement

1. Lower GE T2100 Treadmill to 0% grade.
2. Turn the power switch off, disconnect the power cord from the wall outlet, and remove the shroud.
3. Remove old potentiometer harness assembly. See “[Location of Major Sub-Assemblies](#)” on page 7-4.

CAUTION

DO NOT apply any pulling force to the potentiometer shaft. If this does occur, the entire potentiometer harness will require replacement. The potentiometer is susceptible to damage resulting from an axial pulling force on the shaft (see figure).



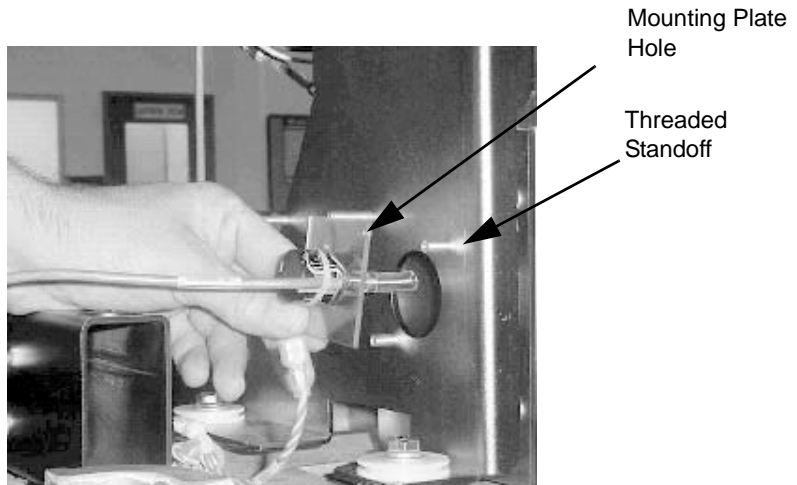
037

Potentiometer Installation Procedure:

1. Remove the nut and washer from the potentiometer.
2. Attach the mounting plate to the potentiometer and secure with the washer and nut provided.
3. Attach the plastic coupling tube to the potentiometer to approximately 1/3rd of the coupling tube length, such that there is sufficient length remaining to attach to the elevation shaft. Do not press the tubing on any farther than it needs to. We want to avoid

pulling the tubing off the shaft if it is pressed on too far (see caution statement).

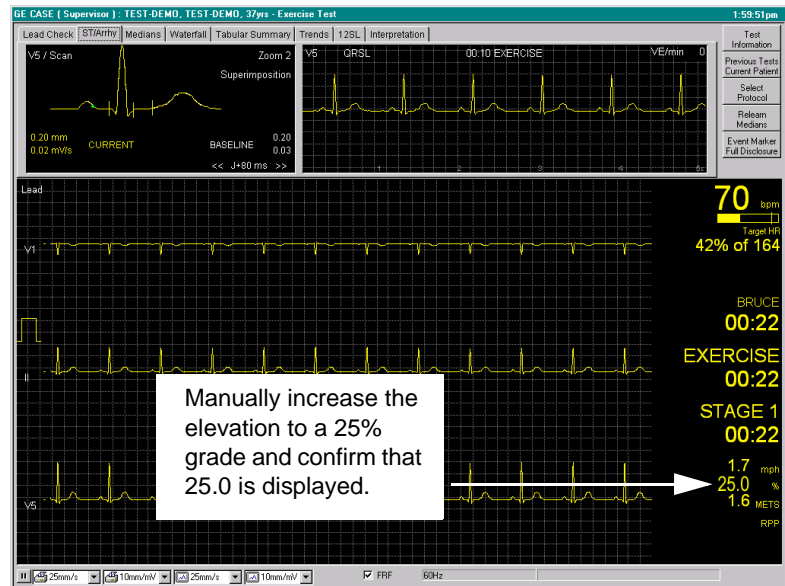
4. While looking at the shaft end of the potentiometer, rotate the shaft CCW until it stops. Then rotate the shaft 1–2 turns CW.
5. Attach the harness assembly to the unit by guiding the potentiometer (with tube attached) through the clearance hole in the chassis tower. Make sure the harness assembly is oriented such that the mounting plate holes are in general alignment with the threaded stand-offs. This must be done in order to maintain the 1–2 turns established in Step 4. Also be sure that the cables are toward the rear of the GE T2100 Treadmill. Attach the tube far enough on to the elevation shaft such that the mounting plate is within 1/16th inch or less of the threaded stand-offs.



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6. Secure the mounting plate with the appropriate screws.
7. Connect the other end of the harness to the Control PCB as required.
8. Power on the unit and run calibration to ensure proper operation of elevation system.
9. Test the GE T2100 Treadmill using the CASE system (or other controlling device) to ensure the GE T2100 Treadmill is capable of reaching its lower and upper limits. Confirm that the requested vs. actual elevation (as reported by the example CASE application screen below) match at 0% grade and at 25% grade. If the actual elevation does not reach 25% grade, the 1–2 turns preset established

in Step 4 may have been altered during Step 5. Refer to the Potentiometer Removal Guidelines below.



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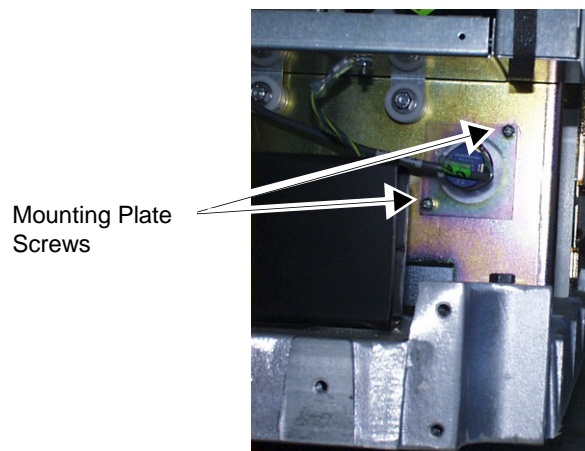
10. Re-assemble the remaining components to complete the overall GE T2100 Treadmill assembly.

Potentiometer Removal Guidelines

NOTE

If it is necessary to remove the potentiometer with the intention of re-installation, please follow these guidelines to reduce the risk of damage to the potentiometer.

1. Remove the two mounting plate screws.



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CAUTION

DO NOT apply any pulling force to the potentiometer shaft. If this does occur, the entire potentiometer harness will require replacement. The potentiometer is susceptible to damage if axial pulling forces are applied to the shaft.

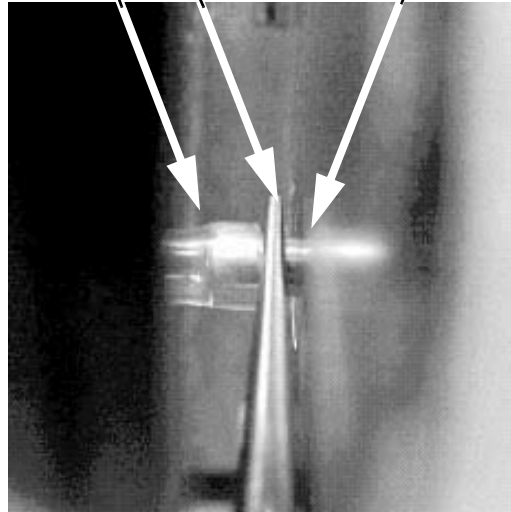
Do not attempt to remove the potentiometer by grabbing the potentiometer and pulling it off.



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2. Use a long, thin needle nose pliers and place on the elevation shaft, behind the coupling tube.

Coupling Tube Needle-nose Pliers Elevation Shaft



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3. Gently push the tube to the left to remove it from the elevation shaft.

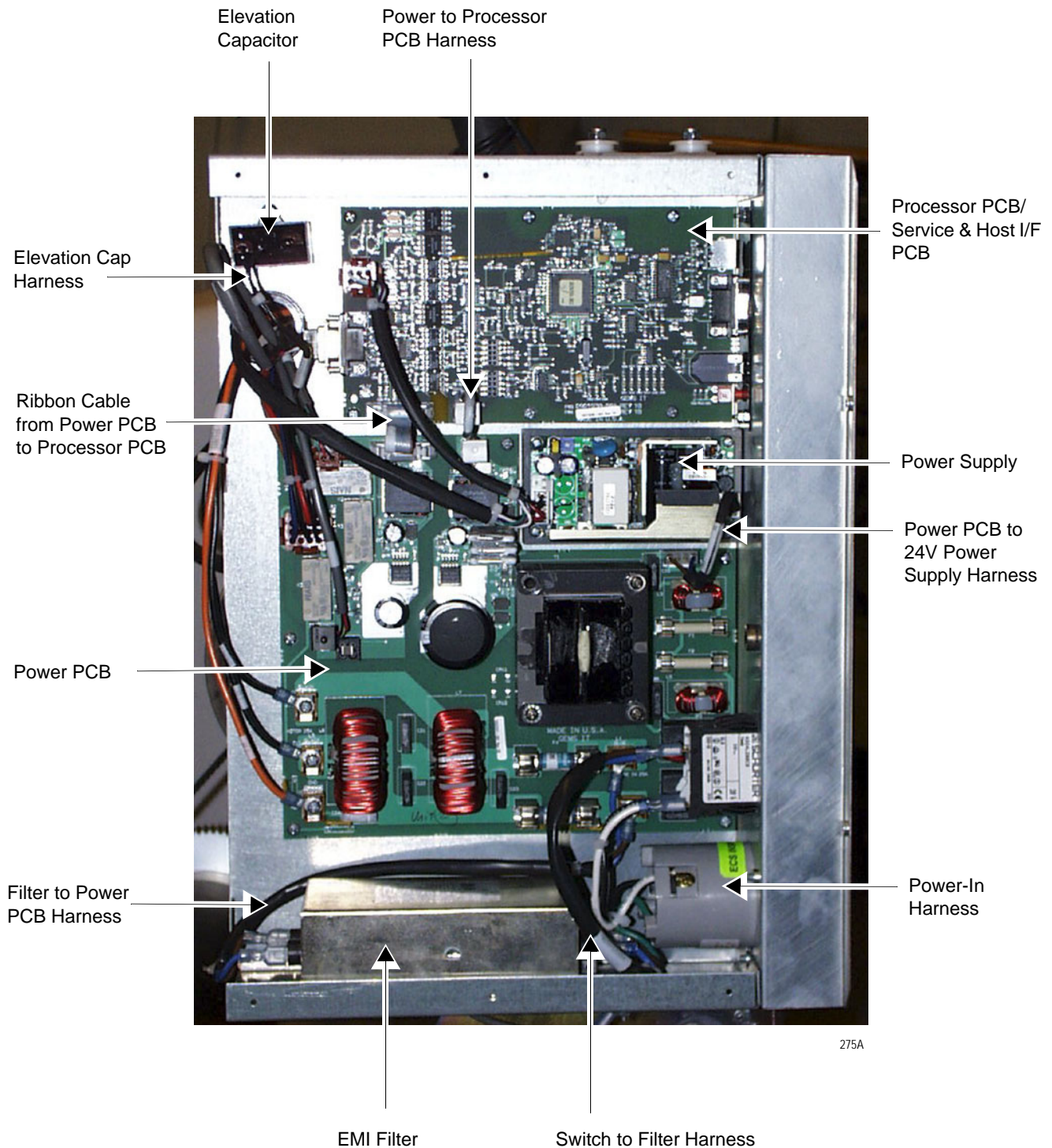
NOTE

If needle-nose pliers are not available, a standard slotted screwdriver can be used to work the coupling tube off the elevation shaft.



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PCBs and Power Supply Replacement



NOTE

Electrostatic discharge can harm the PCB boards and power supply. The following guidelines help protect the PCB boards and power supply from ESD damage.

- ◆ Keep the new PCB boards and power supply in their anti-static bags until they are ready to be installed.
 - ◆ Discharge any static charge you may have built up before handling the PCB boards and power supply. (Touch a metal surface to discharge a spark.)
 - ◆ Handle the PCB boards and power supply by their edges. Do not touch the semi-conductor components.
-
1. Turn the power switch off, disconnect the power cord from the wall outlet, and remove the shroud.
 2. Remove the e-box cover.
 3. Disconnect any wiring harnesses/connections.
 4. Unscrew the mounting screws.
 5. Fasten the new PCB/power supply to the e-box using the mounting screws.
 6. Reconnect any wiring harnesses/connections.
 7. Replace the e-box cover and the shroud.
 8. Calibrate the GE T2100 Treadmill. See “Self-Calibration” on page 3-10.”

For your notes

8 Ordering Parts

For your notes

Ordering Parts

Field Replaceable Units

Below is a table identifying the field replaceable units (FRUs) and their part numbers.

NOTE

The drive motor, sprocket, and flywheel should be ordered together whenever replacing either of these FRUs. They are fitted with tight machined tolerances and may be difficult to disassemble.

GE Part Number	Description
2023710-001	Drive Motor (see note above)
2023254-001	Sprocket (see note above)
2023253-001	Flywheel (see note above)
2026182-002	Drive Controller w/ firmware (Exchangeable)
88380-007	Emergency Stop Switch (ESTOP)
700338-002	Harness, Elevation Limit Switch
2023887-001	Braking Resistor & Harness
2023446-001	Communication Harness Processor to Drive Controller
2023442-001	24Volt Distribution Harness
2026180-001	Shroud w/ T2100 label (front)
2026390-001	Shroud Cover w/ service label (rear)
2022341-001	Power PCB (located in the e-box)
2021939-001	Processor PCB/Service & Host I/F PCB (located in the e-box)
2026599-001	Power Supply (located in the e-box)
2023445-001	Power PCB to 24V Power Supply Harness (located in the e-box)
2023441-001	Ribbon Cable from Power PCB to Processor PCB (located in the e-box)
2024974-001	Power to Processor PCB Harness (located in the e-box)
2024413-001	Elevation Cap Harness (located in the e-box)
2024412-001	Filter to Power PCB Harness (located in the e-box)
2015553-001	EMI Filter (located in the e-box)
408934-001	Switch to Filter Harness (located in the e-box)

GE Part Number	Description
410570-001	Elevation Capacitor (located in the e-box)
408935-002	Power-In Harness (located in the e-box)
1910-012	FUSE 3AG, .5 Amp SB, F3, F5
2023406-002	FUSE 13/32 FLM 20 Amp SLOW F4, F6
420824-001	FUSE SB, 2.5 Amp, 250Volt F1, F2
700609-001	RS 232 Interface Cable (for CASE to GE T2100 Treadmill, and GE T2100 Treadmill to TDU on laptop)
408890-001	Elevation Motor
408895-001	Roller Assy Front
408896-001	Roller Assy Rear
408897-001	Rack STL 10P 14.5°
408913-001	Belt, drive
2023183-002	Harness, Elevation Pot, T2100
56944-009	Walking Board w/ Wax
3602-009	Belt, walking

NOTE

For technical support parts reference, see:

- ◆ 2026431-001 (domestic) GE T2100 Treadmill with handrails
- ◆ 2026431-002 (international) GE T2100 Treadmill with handrails

Appendix A – Technical Specifications

For your notes

Technical Specifications

Table 18. Performance Specifications

Item	Specification
Maximum Rated Load	182 kg (450 lbs)
Drive Motor	3.0 HP, brushless, DC motor
Elevation Motor	0.13 HP
Belt Speed Range	0.0 to 22.5 km/h (0 to 13.5 mph) at 220V, @ 50/60 Hz continuously variable, zero mph start-up
Belt Speed Tolerance	1.6 km/h; ± 0.16 km/h (1 mph; ± 0.09 mph)
Belt Speed Acceleration/Deceleration	Approximately 0.8 km/sec (0.5 mph/sec)
Elevation Range	0.0 to 25.0% grade, continuously variable
Elevation Range Increase/Decrease	1.14%/sec. @ 60 Hz
Manual Treadmill Controller (Optional)	Functions: On, Off, Up, Down, Fast, Slow, Automatic Protocol Selection, Elapsed Time, Distance Traveled Automatic Protocols: 15 exercise and 15 rehabilitation (includes Bruce, Naughton, Balke II, Ellestad, Low Performance)
Maximum Leakage Current	100 μ A, chassis to ground
Interface	Either RS-232 port or RS-422 serial port, 9600 baud
Mode of Operation	Continuous
Degree of protection against ingress of water	Ordinary

Table 19. Physical Specifications

Item	Specification
Weight	181.4 kg (400 lb)
Walking Area	45.7 cm x 152.4 cm (18 in x 60 in)
Floor Space Required	73.7 cm x 195.6 cm (29 in x 77 in)
Walking Surface Height	14.0 cm (5.5 in)
Handrail Height Above Walking Surface	Front: 101.6 cm (40 in) Side: Maximum 88.9 cm (35 in) descending at 5° angle to 81.3 cm (32 in)

Table 20. Power/Environmental Specifications

Item	Specification
Power Requirements	200 to 240 VAC, 50– 60 Hz, single phase, 20 A, NEMA 6-20 R wall outlet (U.S. domestic only, or applicable international connection; dedicated circuit recommended)
Power Consumption	1540 watts, 16 A

Table 21. Safety

Item	Description
Certification	UL/cUL classified
Type of Protection Against Electrical Shock	Class 1, type B applied part
Degree of Protection Against Ingress of Liquids	Ordinary
Handling of Disposable Supplies and Other Consumables	Use only parts and accessories manufactured or recommended by GE Medical System <i>Information Technologies</i> . Follow manufacturer's instructions for use for disposable/consumable product. Follow local environmental guidelines concerning the disposal of hazardous materials (e.g. lead acid batteries).
Patient Mode of Operation	Continuous
Patient Leakage Current	Not applicable
Degree of Protection Against Electrical Shock	Not applicable
Maintenance Frequency	Test the stop switch assembly monthly. Recommended user daily visual inspection and cleaning. Recommended six-month routine maintenance checks and test procedures performed by qualified technical personnel.
Repair Guidelines	Calibration instructions, equipment descriptions, and all other service information to repair those parts of the equipment designated as field repairable by qualified technical personnel is available in the service manual.

Table 22. Environmental

Item	Description
Operating Conditions	
Ambient temperature	10°C to 40°C (50°F to 104°F)

Table 22. Environmental	
Relative humidity	20% to 90%
Atmosphere pressure	525 mmHg to 795 mmHg (20.7 to 31.3 in Hg)
Storage Conditions	
Temperature range	–40°C to 70°C (–40°F to 160°F)
Relative humidity	15% to 95%
Atmosphere pressure	500 hPa to 1060 hPa (375 mmHg to 795 mmHg)

UL Classification



Medical Equipment
 With Respect to Electric Shock,
 Fire, and Mechanical Hazards Only,
 In Accordance with UL 60601-1,
 CAN/CSA C22.2 No.601.1, and
 IEC 60601-1

Appendix B – Electromagnetic Compatibility (EMC)

For your notes

Electromagnetic Compatibility (EMC)

Changes or modifications to this system not expressly approved by GE Medical Systems can cause EMC issues with this or other equipment. This system is designed and tested to comply with applicable regulation regarding EMC and must be installed and put into service according to the EMC information stated in this appendix.

WARNING

Use of portable phones or other radio frequency (RF) emitting equipment near the system may cause unexpected or adverse operation.

WARNING

The equipment or system should not be used adjacent to, or stacked with, other equipment. If adjacent or stacked use is necessary, the equipment or system should be tested to verify normal operation in the configuration in which it is being used.


Electromagnetic Emissions

Guidance and manufacturer's declaration – electromagnetic emissions		
The <i>GE T2100 Treadmill</i> is intended for use in the electromagnetic environment specified below. The customer or user of the <i>GE T2100 Treadmill</i> should assure that it is used in such an environment.		
Emissions Test	Compliance	Electromagnetic Environment – Guidance
RF emissions (Radiated) 2 30 MHz to 1,000 MHz IEC 60601-1-2:2004 O CISPR11:1997 / A1:1999 / A2:2002 O EN 55011:1998 / A1:1999 / A2:2002	Class A	Class A use The <i>GE T2100 Treadmill</i> is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
RF emissions (Conducted) 2 150 KHz to 30 MHz IEC 60601-1-2:2004 O CISPR11:1997 / A1:1999 / A2:2002 O EN 55011:1998 / A1:1999 / A2:2002	Class A	
Harmonic Emissions 2 2 nd – 40 th Harmonic IEC 60601-1-2:2004 O EN 61000-3-2:2000 / A1:2001	Class A	The <i>GE T2100 Treadmill</i> is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Voltage fluctuations/ Flicker emissions IEC 60601-1-2 O EN 61000-3-3:1995 / A1:2002	Complies (Pass)	

Electromagnetic Immunity

Guidance and manufacturer's declaration – electromagnetic immunity			
The <i>GE T2100 Treadmill</i> is intended for use in the electromagnetic environment specified below. The customer or user of the <i>GE T2100 Treadmill</i> should assure that it is used in such an environment.			
Immunity Test	Compliance Test level	Compliance level	Electromagnetic Environment – Guidance
Electrostatic discharge (ESD) IEC 60601-1-2:2004 O EN 61000-4-2:1995 / A1:1998 / A2:2001	± 2/4/6 kV indirect ± 2/4/6 kV direct ± 2/4/8 kV air	± 2/4/6 kV indirect ± 2/4kV direct ± 2/4/8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst (EFT) IEC 60601-1-2:2004 O EN 61000-4-4:1995 / A1:2001	± 2 kV for power supply lines ±1 kV for input/output lines	± 2 kV for power supply lines ±1 kV for input/output lines	Mains power should be that of a typical commercial or hospital environment.
Fast Transient Surge (FTS) IEC 60601-1-2:2004 O EN 61000-4-5:1995 / A1:2001	± 500V/1 kV differential mode ± 2 kV common mode	± 500V/1 kV differential mode ± 2 kV common mode	Mains power should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 60601-1-2:2004 O EN 61000-4-11:1994 / A1:2001	<5% U_t (>95% dip in U_t) for 0.5 cycles <40% U_t (>60% dip in U_t) for 5 cycles <70% U_t (>30% dip in U_t) for 25 cycles <5% U_t (>95% dip in U_t) for 5 s	<5% U_t (>95% dip in U_t) for 0.5 cycles <40% U_t (>60% dip in U_t) for 5 cycles <70% U_t (>30% dip in U_t) for 25 cycles <5% U_t (>95% dip in U_t) for 5 s	Mains power should be that of a typical commercial or hospital environment. If the user requires continued operation during power mains interruptions, it is recommended that power be supplied from an applicably rated uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 60601-1-2:2004 O EN 61000-4-8:1993 / A1:2001	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristics of a typical location in a typical commercial or hospital environment.
NOTE: U_t is the a.c. mains voltage prior to application of the test level.			

Electromagnetic Immunity

Guidance and manufacturer's declaration – electromagnetic immunity			
The <i>GE T2100 Treadmill</i> is intended for use in the electromagnetic environment specified below. The customer or user of the <i>GE T2100 Treadmill</i> should assure that it is used in such an environment.			
Immunity Test	Compliance Test level	Compliance Level	Electromagnetic Environment – Guidance
<p>Conducted RF</p> <p>IEC 60601-1-2:2004</p> <p>O EN 61000-4-6:1996 / A1:2001</p> <p>Radiated RF</p> <p>IEC 60601-1-2:2004</p> <p>O EN 61000-4-3:2002 / A1:2002</p>	<p>3 Vrms</p> <p>150 KHz to 80 MHz</p> <p>@ 2 Hz mod.</p> <p>3 V/m</p> <p>80 MHz to 2.5 GHz</p> <p>@ 1 KHz mod.</p>	<p>3 V rms</p> <p>3 V/m</p>	<p>Portable and mobile RF communications equipment should be used on closer to any part of the [equipment or system], including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.</p> <p>Recommended separation distance</p> $d = [3.5/\sqrt{P}] \sqrt{P}$ $d = [3.5/E1] \sqrt{P} \quad 80 \text{ MHz to } 800 \text{ MHz}$ $d = [7/E1] \sqrt{P} \quad 800 \text{ MHz to } 2.5 \text{ GHz}$ <p>where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).</p> <p>Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey ^a, should be less than the compliance level in each frequency range.</p> <p>Interference may occur in the vicinity of equipment marked with the following symbol:</p> 
NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.			
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by reflection from structures, objects, and people.			
a	Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, and electromagnetic site survey should be considered. If the measured field strength in the location in which the <i>GE T2100 Treadmill</i> is used exceeds the applicable RF compliance level above, the <i>GE T2100 Treadmill</i> should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the <i>GE T2100 Treadmill</i> .		
b	Over the frequency range 150 KHz to 80 MHz, field strengths should be less than 3 V/m.		

Separation Distance

Recommended separation distances between Portable and mobile RF communications equipment and the <i>GE T2100 Treadmill</i>			
The <i>GE T2100 Treadmill</i> is intended for use in the electromagnetic environment on which radiated RF disturbances are controlled. The customer or the user of the <i>GE T2100 Treadmill</i> can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the <i>GE T2100 Treadmill</i> as recommended below, according to the maximum output power of the communications equipment.			
Rated maximum output power of transmitter W	Separation distance (meters) according to frequency of transmitter		
	150 kHz to 80 MHz $d = [3.5/\sqrt{P}] \sqrt{P}$	80 MHz to 800 MHz $d = [3.5/E1] \sqrt{P}$	800 MHz to 2.5 GHz $d = [7/E1] \sqrt{P}$
0.01	.11	.11	.23
0.1	.37	.37	.74
1	1.16	1.16	2.33
10	3.69	3.69	7.38
100	11.66	11.66	23.33
For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.			
NOTE 1 At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.			
NOTE 2 These guidelines may not apply in all instances. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

Exceptions

EMC Exception(s) Disclosure		
Type	Exception	Electromagnetic Environment Guidance
Electrostatic discharge (ESD)	<u>Direct discharge I/O connectors compliance level to 4kV only</u>	Do not expose the connection panel at the rear of the <i>GE T2100 Treadmill</i> to any source of ESD while in operation.
Electrical fast transient/burst (EFT)	<u>No Exceptions</u>	N/A
Fast Transient Surge (FTS)	<u>No Exceptions</u>	N/A
Voltage dips, short interruptions and voltage variations on power supply input lines	<u>No Exceptions</u>	N/A
Power frequency (50/60 Hz) magnetic field	<u>No Exceptions</u>	N/A
Conducted RF	<u>No Exceptions</u>	N/A
Radiated RF	<u>No Exceptions</u>	N/A

Compliant Cables and Accessories

WARNING

The use of accessories, transducers and cables other than those specified may result in increased emissions or decreased immunity performance of the equipment or system.

The table below lists cables, transducers, and other applicable accessories with which GE Medical Systems claims EMC compliance.

NOTE: Any supplied accessories that do not affect EMC compliance are not included.

Part No	Description	Maximum Cable / Cord Lengths
408930-001	Power Cable Domestic	3 m / 10 ft
408930-002	Power Cable International	3 m / 10 ft
700609-001B	RS232 Communication Cable	6 m / 20 ft
400073-001	RS422 Communication Cable	6 m / 20 ft
88380-007	ESTOP Cable	3 m / 10 ft
700378-002	MTC Communication Cable	1.5 m / 5 ft

For your notes